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NOTES ON
National Forest Range Plants

PART I

GRASSES

BY THE
OFFICE OF GRAZING STUDIES
FOREST SERVICE

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1914

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NATIONAL FOREST RANGE PLANTS

GRASSES

As grazing management on National Forest ranges becomes more intensive it is necessary to work out to a finer degree the class of stock to which each area of range is best adapted; the number of stock it will carry; the season of grazing which will give the most efficient use; plans for rotation grazing in order to secure maximum utilization without loss of forage through non use; the location and proper management of areas infested with poisonous plants or plants otherwise dangerous to stock; methods of retarding the increase in worthless species and promoting the increase of valuable species; as well as other problems affecting grazing management in connection with silvicultural and watershed protection. These phases of intensive management while involving local conditions of the stock industry, supply of water for stock, topography and other minor local factors are most directly dependent for solution upon adequate knowledge of the vegetation making up the forage crop. The specialists may work out experimentally satisfactory methods for given conditions of vegetation. The application of these methods, or the fundamental principles in actual grazing management throughout the forests, therefore, naturally is dependent upon a wide knowledge of the vegetation. This is true of poisonous plant investigations, rotation grazing, adaptability of range, seasons of grazing and carrying capacity.

The collection of this information is not the work of a month or a year. It must come as the result of accumulation and education. In 1911 plant collecting on a scale of some magnitude was undertaken by Forest officers and since that time approximately 18,000 plant specimens, including about 3,000 species, have been submitted for identification. The accumulation and compilation of economic notes was systematically begun at the same time and throughout 1912 and 1913 the identification has been supplemented by such economic notes as were available. In part to obviate the necessity for much duplicate writing of cards; in part to bring together descriptions and notes from scattered sources and make them available for use by field men not equipped with the many separate ref-

erence books; and in part to lay the foundation for building up comprehensive information of the range plants on National Forests, it is planned to print the notes as rapidly as they can be prepared in suitable form. This booklet, the first of the series, includes the grasses collected to date. It is intended for the use of Forest officers only, and is in no sense intended as an official publication for public distribution as the material is not in shape for such use.

It will be noted that under the headings "Flowering Period," "Seed Dissemination," and "Forage Value" the statement "more data needed" occurs frequently. This is to be expected as a great number of the species have been observed only to a limited extent or not at all on the range. It will be found, too, no doubt, that the notes given will not always agree with local information due to the fact that the value of a species varies slightly in different plant associations, different habitats, and different localities. Occasionally it has been found that the same class of stock in one locality will eat a given species, but in another locality will not, even though it is growing in essentially the same habitat and associated with the same species. These points are raised to show the desirability of local Forest officers checking the notes for individual species in cases where they are certain of the identification. Additional information and corrections are not only desired but requested.

As far as time would permit the notes have been checked with all information received in Forest Service collections and with the literature on the subject. In many cases reference is made to publications and to notes received from individual Forests. In the majority of cases, however, the reference has been omitted to save space and to simplify the notes. Since the booklet is not intended for public distribution this is considered permissible.

Question may be raised as to the necessity for descriptions to the extent given. The notes will be used by reconnaissance parties and individuals who will do field identification for immediate use, submitting specimens later for check identification. To do this without the descriptions here given it would be necessary to carry a number of publications, which at best would not include all the species, as some of them have been published only in the original description.

So far as considered practicable technical terms and microscopic characters have been avoided. Reasonable accuracy, however, necessitates the use of both at times. The appended glossary, if referred to in connection with the reading of the notes, will aid the field men who are not versed in systematic botany in accumulating sufficient knowledge of botanical terms to become familiar with

the characters used as the basis of classification as well as with the main tribal and generic distinctions. To aid the reader further in grouping the plants according to relationships a key to the tribes, based largely upon characters visible without microscope, is included. Also, to serve in part the same purpose of grouping related species a generic description is included for each genus. In addition, the genus descriptions will give the collector some idea as to the distribution and value of a plant in case a specimen can be identified generically but not to species and they cut down the volume by eliminating repetition of characters common to all species of the genus.

The United States Department of Agriculture is accepted as authority in the choice of botanical names. The synonymous names used in the more widely known manuals are included as far as possible. In a few cases the botanical name given differs from the one given in notes previously sent out. The change is occasioned by the Department later authorizing the name here given.

The common names given do not always agree with those previously sent out. As the number of species has increased confusion in the use of common names also has increased, individual species frequently being known by several names and the same name used for different species. This confusion will continue unless effort is made at standardization. Accordingly, only one common name is given opposite the botanical name preceding the notes of a species. The other known common names are listed at the end of the description. In selecting the preferred common name an attempt has been made to choose one of generic value to show some relationship of the species to the genus, thus "wheat-grass" as a common name is restricted to *Agropyrons*; "squirrel-tail" to *Sitanions*, etc. The use of the same common name for two species, not unusual heretofore, has been avoided and has made it necessary to change many common names previously used. Suggestions for improving the names given are desired. The above points should be kept in mind, however, in order to avoid ambiguity and show some relation between the common name and the botanical characteristics.

The index of species by Forest Service districts is included to give a concrete conception of the grasses in each district without going through the entire booklet, thereby making the text more valuable for district reference. These lists will be the most convenient, also, for use by the supervisor in checking off the species collected on his forest.

The index of common names is for convenience of those who are more familiar with the common than the botanical names. If the

common name given is not the local one for the species the individual can insert the name known to him. It is advisable, however, to become familiar with the name given or register a reasonable objection to it.

The index of botanical names supplemented by abbreviations showing the districts and forests where the species has been collected by the Forest Service is for the purpose of indicating the plants most widely distributed and to serve as a record of distribution which may be conveniently added to as new collections are made.

The cooperation of the field force in perfecting the data on habitat, flowering period, seed dissemination and forage value is solicited.

KEY TO GRASS TRIBES.

1. So-called Subfamily **PANICACEAE**. Spikelets 1, *rarely* 2-flowered; when 2-flowered the 2d or *terminal floret perfect*, the 1st or lower floret being staminate or neuter. Spikelets articulated below the glumes so that all parts of the spikelet fall off together. Spikelets more or less *dorsally* flattened.

- A. Spikelets *in pairs* (or terminal spikelets in 3's) *one sessile* or nearly so and fertile, the other or *lateral spikelet stalked*, staminate or rudimentary. Fertile spikelet with 2 *hardened glumes*, a sterile or staminate lemma (so-called "3d glume") similar in texture and appearance to the glumes, and a fertile *lemma very thin* and often twisted-awned. Raceme *spike-like*, the rachis usually *jointed*. Stems usually solid.

Andropogoneae, Beard-grass Tribe.

Genera.

Andropogon

**Holcus*

Heteropogon

Sorghastrum

- B. Spikelets *not in pairs*; glumes thinner in texture than the lemma.

- a. Spikelets *solitary or in groups of 2 to 8 at each joint of the rachis*, each group falling off as a whole. First glume usually *larger than* 2d and both usually larger than the floret.

Zoysieae (or **Osterdamieae**), Korean Lawn-grass Tribe.

Genera.

Hilaria

Pleuraphis

Nazia

- b. Spikelets *not in groups*, (except *Cenchrus*) falling singly. Usually 2 glumes and 1 lemma, the glumes *shorter* than the lemma and the 1st glume almost always *shorter* than the 2d glume. When a 2d lemma, "3d glume", is present it is ordinarily neuter but sometimes staminate.

Paniceae, Millet Tribe

Genera.

Cenchrus

Paspalum

Chaetochloa

Syntherisma

Echinochloa

Valota

Panicum

*Not to be confused with Velvet-grass (*Notholcus* spp.) called *Holcus* in some of the books.

2. So-called Subfamily **POACEAE**. Spikelets 1 to many-flowered, the imperfect or rudimentary floret, if any, usually uppermost. Spikelets (except in the following genera: *Alopecurus*, *Cinna*, *Beckmannia*, *Notholcus*, *Polypogon* and *Sphenopholis*) articulated above the glumes, so that the glumes remain on the rachilla after the residue of the spikelet falls off. Spikelets more or less laterally flattened. In the 6 genera cited above the spikelets are strongly flattened laterally so that they can readily be distinguished from the **PANICACEAE**.

A. Spikelets with only 1 perfect floret; in panicles, which are sometimes contracted and spike-like but never 1-sided.

- a. Spikelets with 1 perfect floret and a pair of staminate or rudimentary florets below, the latter occasionally reduced to bristles.

Phalarideae, Canary-grass Tribe.

Genera.

<i>Anthoxanthum</i>	<i>Savastana</i>
<i>Phalaris</i>	

- b. Spikelets entirely 1-flowered. Glumes 2 and thicker than the lemma.

Agrostideae, Redtop-Timothy Tribe.

Genera.

<i>Agrostis</i>	<i>Gastridium</i>
<i>Alopecurus</i>	<i>Lycurus</i>
<i>Ammophila</i>	<i>Muhlenbergia</i>
<i>Aristida</i>	<i>Oryzopsis</i>
<i>Blepharoneuron</i>	<i>Phleum</i>
<i>Calamagrostis</i>	<i>Polypogon</i>
<i>Calamovilfa</i>	<i>Sporobolus</i>
<i>Cinna</i>	<i>Stipa</i>
<i>Epicampes</i>	

B. Spikelets 1 to several-flowered; in spikes.

- a. Spikelets arranged in a double (rarely single) row along one side of the rachis, forming a unilateral spike. Spikes solitary, in panicles, or in terminal, digitate (finger-like) clusters.

Chlorideae, Grama Tribe.

Genera.

<i>Beckmannia</i>	<i>Chloris</i>
<i>Bouteloua</i>	<i>Leptochloa</i>
<i>Bulbilis</i>	<i>Schedonnardus</i>
<i>Capriola</i>	

- b. Spikelets alternating each other in zigzag fashion on opposite sides of a jointed and grooved rachis, forming terminal spikes. Leaf-blades bear at base a more or less conspicuous pair of ear-like appendages.

Hordeae, Barley-Wheat Tribe.

Genera.

<i>Agropyron</i>	<i>Lolium</i>
<i>Elymus</i>	<i>Sitanion</i>
<i>Hordeum</i>	<i>Triticum</i>
<i>Hystrix</i>	

C. Spikelets 2 to several-flowered, in racemes or in open or contracted panicles.

- a. *Awned* (except *Koeleria* and *Sphenopholis*), the awns usually twisted, borne dorsally on the lemma or between the teeth of its 2-toothed apex; glumes usually longer than the 1st floret; rachilla prolonged behind the palea of the uppermost floret.

Aveneae, Oat Tribe.

Genera.

<i>Aira</i>	<i>Koeleria</i>
<i>Avena</i>	<i>Notholcus</i>
<i>Danthonia</i>	<i>Sphenopholis</i>
<i>Deschampsia</i>	<i>Trisetum</i>

- b. Sometimes awned, the awn, when present, *terminal and straight* (apex of lemma 2-toothed in *Bromus* and in certain species of *Festuca* and *Melica*); spikelets stalked; larger florets below; glumes 2, usually shorter than the 1st floret.

Festuceae, Fescue-Bluegrass-Brome Tribe.

Genera.

<i>Achyrodes</i>	<i>Munroa</i>
<i>Briza</i>	<i>Panicularia</i>
<i>Bromus</i>	<i>Phragmites</i>
<i>Catabrosa</i>	<i>Pleuropogon</i>
<i>Dactylis</i>	<i>Poa</i>
<i>Distichlis</i>	<i>Puccinellia</i>
<i>Eragrostis</i>	<i>Redfieldia</i>
<i>Festuca</i>	<i>Tridens</i>
<i>Korycarpus</i>	<i>Triplasis</i>
<i>Melica</i>	

ACHYRODES.

Achyrodes is a member of the *Festuceae*, the Fescue-Bluegrass-Brome tribe of grasses. The genus *Achyrodes* consists of a single species native of s. Europe and now introduced into Cal.

***Achyrodes aureum* (L.) Kuntze**

Goldentop

Lamarckia aurea (L.) Moench.

RANGE: Native of the Mediterranean region. Naturalized in s. Cal. and Lower Cal.

DESCRIPTION: A tufted, branching annual with stems erect or decumbent at the base, 4 to 15 in. high. Leaves smooth, thin, 1 to 4 in. long, and 1-12 to 1-4 in. wide. Panicle one-sided, dense, 1 to 3 in. long, 1-2 to 1 in. wide, shining, golden-yellow or purplish, the branches close, short, erect; pedicels clustered, pubescent, the cluster with a tuft of long whitish hairs at the base; spikelets of 2 forms, the terminal one of each cluster fertile, the other sterile; fertile spikelet about 1-12 in. long, with 1 perfect floret, the rachilla produced beyond the floret into a slender stalk bearing a short-awned empty lemma or reduced wholly to an awn; the sterile spikelets linear, 1 to 3 in each cluster, 1-4 to 1-3 in. long; glumes narrow, thin, about 1-12 in. long, pointed or short-awned, 1-nerved; lemma broader, 1-nerved, bearing below the apex a slender straight awn.

HABITAT: Cultivated as an ornamental grass and now escaped from cultivation.

FLOWERING PERIOD: Mar. to May.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: More data needed.

AGROPYRON

Commonly called "Wheat-grasses." Long considered by botanists to be congeneric with cultivated wheat (*Triticum* spp.) from which genus it differs mainly in being perennial instead of annual, and in having the two lowest scales of the spikelets ("glumes") lance-shaped and sharp-pointed, instead of having the characteristic "boat shape" of wheat.

Erect, simple-stemmed grasses of the *Hordeae* or Barley-Wheat tribe, with terminal, often bearded spikes. Spikelets 3 to many-flowered, often compressed or flattened, closely sessile and single, very rarely (e. g., *A. flexuosum*) in pairs, arranged in zigzag fashion in alternate notches of the spike axis, flatwise, with their sides turned toward the axis; they are jointed just above the glumes so that these persist when the remainder of the spikelet drops off. The glumes are often bearded and are about equal in size, firm in texture, narrower and usually shorter than the upper scales. The grain is narrowly linear or spindle-shaped, grooved, pubescent at the apex, and adheres closely to the palea which envelops it and falls off with it.

Agropyrons rank very high as forage plants in nutritiousness and palatability, though few of them are very abundant in any one locality. About 35 species, distributed throughout the world in temperate climates, are known. The genus is especially well represented in our western States, where about 20 species occur, Colorado, with 15 known species, being about the center of distribution. Four species are each limited, so far as known, to a single State: *A. albicans* apparently being confined to Mont., *A. laeve* and *A. parishii* to Cal., and *A. saxicola* to Wash.

Agropyron albicans Scribn. & Smith

Montana wheat-grass

RANGE: Indigenous, so far as known, to w. Mont.

DESCRIPTION: A whitish-colored, stoloniferous grass, with slender erect stems 1 to 2 ft. high, clothed at the base with dead leaf-sheaths. Leaves bluish green, rigid, ascending, linear to inrolled, roughish throughout, 2 1-2 to 5 in. long. Spikes whitish in appearance, slightly nodding, 3 to 4 in. long, composed of 8 to 10 much compressed, pubescent, distant spikelets. Very closely related to *A. dasystachyum* and *A. smithii molle*, but readily distinguished from both by its spreading bent awns. Also known as White agropyron.

HABITAT: About 4,500 to 8,500 ft.

FLOWERING PERIOD: July and Aug.

SEED DISSEMINATION: Aug. and Sept.

FORAGE VALUE: Reported, from the Beartooth N. F., to be "grazed by all classes of stock."

Agropyron biflorum (Brignoli) Roem. & Schult.

Synonymous, in its western range, with *Agropyron violaceum* (Hornem.) Lange.

Agropyron caninum (L.) Beauv.

Bearded wheat-grass

RANGE: Greenl. and N. S. to N. C. and w. to Alaska and Cal. Native n.; naturalized s.

DESCRIPTION: A smooth slender and erect-stemmed bunchgrass, 2 to 4 ft. high, the leaves rather broad, smooth beneath and usually rough above, 3 to 10 in. long, 1-12 to 1-3 in. wide, rather abundant near the base. Spikes 3 to 8 in. long, sometimes 1-sided, frequently inclined to be somewhat nodding at the top, often more or less purplish. Spikelets cylindrical, 3 to 6-flowered, the 2 lowest scales about

as long as the spikelet and tipped with an awn 1-3 in. long; the upper scale is 2-toothed at the apex, from which is projected a short awn.

HABITAT: Characteristic usually of light sandy soils, occurring mainly in river bottoms and on moist slopes; found more scatteringly on dry hillsides and dry mountain meadows. At elevations up to about 7,500 ft. in Colo. Reported to be "confined to heavier soils" in n. Cal.

FLOWERING PERIOD: July and Aug.

SEED DISSEMINATION: Aug. and Sept.

FORAGE VALUE: One of the 5 most widely distributed species of our native western Agropyrons; has been submitted from all U. S. F. S. districts, except 3. It is valuable for all classes of stock. The beards might make it troublesome if eaten in any quantity, but the grass is seldom, if ever, of sufficient abundance in the mature stage on the range to cause trouble. Prof. Aven Nelson says of it: "Its habit of growth and the presence of beards make it a less desirable hay-grass than the other wheat-grasses, but it is of considerable importance as a range and pasture grass."

For a chemical analysis of this species see Wyo. Expt. Sta. Bull. 70, p. 14.

Agropyron dasystachyum (Hook.) Scribn. Northern wheat-grass

RANGE: From Hudson Bay to Man. and s. to Mich., the shores of Lakes Huron, Michigan and Superior, and to Nebr. and e. Colo. West of this range it is supplanted by *A. subvillosum*.

DESCRIPTION: Rather stout, whitish, relatively smooth, 16 to 36 in. high, with long creeping rootstocks. Leaves flat or often becoming inrolled, 2 to 10 in. long, those of the sterile shoots narrower, longer and roughish above. Sheaths rather short, the lower ones finely pubescent or roughish. Spike 2 1-2 to 7 in. long; spikelets unbearded or nearly so, 4 to 8-flowered, erect, narrow, rather long (about 4-5 of an in.) more or less rounded, the glumes tapering-pointed or short-awned, and about half as long as the spikelets. Known also as Thick-stalked agropyron.

HABITAT: Sandy soils.

FLOWERING PERIOD: July and Aug.

SEED DISSEMINATION: Aug. and Sept.

FORAGE VALUE: Very high, wherever occurring to an appreciable extent.

Agropyron dasystachyum subvillosum (Hook.) Scribn. & Smith. See *A. subvillosum* (Hook.) E. Nels.

Agropyron divergens Nees. See *A. spicatum* (Pursh) Scribn. & Smith.

Agropyron divergens inerme Scribn. & Smith. See *A. spicatum inerme* (Scribn. & Smith) Heller.

Agropyron divergens tenuispicum Scribn. & Smith. See *A. spicatum tenuispicum* (Scribn. & Smith) Rydb.

Agropyron flexuosum Piper Sitanion-like wheat-grass

RANGE: Originally known from e. Wash.; now known to occur also in Idaho, Oreg. and s. through the Sierra Nevada into Cal. as far as Mono Co.

DESCRIPTION: A smooth slender-stemmed bunchgrass, 2 to 3 ft. high. Leaf-sheaths smooth, the blades short, flat or somewhat inrolled. Spike 3 to 4 in. long, loosely flowered, flexuous, long-exserted, breaking up at maturity as Sitanions do. Remarkable also for the fact that the spikelets sometimes occur in pairs at each joint of the spike axis. Glumes awl-like, each narrowed into a slender spreading

awn 1-2 to 1 in. long; lemmas also tipped with slender spreading awns 1 in. long or about three times their length.

HABITAT: Mountain slopes. In Cal. "at high altitudes."

FLOWERING PERIOD: More data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: Good forage when young, but the awns or beards are bothersome when headed out. Ranked 9th or last among Agropyrons in District 6.

Agropyron gmelini (Griseb.) Scribn. & Smith

Gmelin's wheat-grass

Triticum caninum gmelini Grisebach

RANGE: Known originally from Siberia; in fact a few authors still hold that the species does not occur in N. Am. Its American range may be stated as from Wash. through Idaho to Mont. and s. through Wyo. and w. Nebr. into n. Colo.

DESCRIPTION: A leafy bunchgrass, 2 to 4 ft. high, with erect, rather slender stems, smooth below, roughish above. Leaf-blades narrow and flat, the basal ones about 1 to 4 in. long, noticeably shorter than the upper blades, which are 5 to 12 in. long. Spike slender, 3 to 9 in. long, the spikelets somewhat crowded, 5 to 9-flowered; glumes lance-shaped, short-awned, 2-3 as long as the spikelet; lemmas awned from or just below the apex with slender, spreading awns sometimes over an inch long. American plants have much smoother lemmas than do the typical Siberian plants. Differs from *A. violaceum* and its allies in the short basal leaves. Known also as Siberian wheat-grass.

HABITAT: Along streams on bottom lands, in timber and other moist soils. In Mont. (fid. Rydberg) on dry soils about 6,000 to 7,000 ft. Found on the Medicine Bow, N. F., under lodgepole between about 8,000 and 10,000 ft.

FLOWERING PERIOD: Aug. and Sept.

SEED DISSEMINATION: Sept. and Oct.

FORAGE VALUE: Palatable, especially to horses and cattle, and nutritious, but seldom, if ever, abundant.

Agropyron gmelini pringlei Scribn. & Smith. See *A. pringlei* (S. & S.) Hitchc.

Agropyron lanceolatum Scribn. & Smith

Idaho wheat-grass

RANGE: Known originally from Idaho, its recognized range having since been extended to e. Wash. and Oreg. and Utah, Wyo. and Colo.

DESCRIPTION: Pale-colored, 2 to 3 ft. high, with running rootstocks. Leaf-sheaths smooth, somewhat enlarged, the lower blades 5 to 12 in. long, flat, becoming inrolled on drying, hairy above, the uppermost blade very short. Spike unbearded, 4 to 6 in. long, narrow, rather open, erect or somewhat bending. Spikelets smooth, erect, flattened, rather large, and lance-shaped (whence the scientific name *lanceolatum*). Closely related to *A. spicatum* from which it differs mainly in its short, sharp-pointed glumes, lance-shaped, sharply tipped spikelets and looser spike.

HABITAT: Typically on plains at medium elevations.

FLOWERING PERIOD: More data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: Nutritious and palatable to all classes of stock, especially horses and cattle, but seldom, if ever, abundant.

Agropyron molle (S. & S.) Rydb. See *A. smithii molle* (S. & S.) Jones

Agropyron occidentale Scribn.

See *A. smithii* Rydb.

Agropyron palmeri (S. & S.) Rydb.

Palmer's wheat-grass

A. spicatum palmeri Scribn. & Smith

RANGE: Colo., N. Mex. and Ariz.

DESCRIPTION: A stout plant, more or less pubescent throughout, clothed at the base with papery leaf-sheaths; possessed of creeping rootstocks. Spikelets erect, close to the main axis. Lemmas sharp-pointed, noticeably pubescent. Resembles *A. smithii* but with stricter spikelets and conspicuously downy leaf-sheaths and lemmas.

HABITAT: In the mountains, up to about 7,500 ft.

FLOWERING PERIOD: More data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: About the same as that of *A. smithii*.

Agropyron pringlei (S. & S.) Hitchcock

Alpine wheat-grass

A. gmelini pringlei Scribner & Smith

RANGE: From Idaho and Mont. to Wyo., characteristic of the Yellowstone Park region; collected also in the Sierra Nevada and on the Klamath N. F. in Cal., and in N. Mex. on the Pecos N. F.; the gap between these localities does not appear to have been filled.

DESCRIPTION: Rather low, tufted, somewhat bent at the base, 10 to 18 in. high, with short, narrow, usually flat leaves, becoming inrolled with age, 2 to 4 in. long. Spike not breaking up on maturity, 2 to 4 in. long. Glumes lance-shaped and terminating in very short awns; lemmas tipped with stout horizontally spreading, sometimes purplish awns, 3-4 of an in. long. Known also as Pringle's wheat-grass.

HABITAT: Gravelly slides and rocky slopes at about 7,000 to 12,000 ft. In Mont. (fid. Rydberg) it is an alpine plant, growing at about 10,000 ft. Collected on the Pecos N. F. on the summit of Mt. Baldy, above timber line, at 11,643 ft.

FLOWERING PERIOD: More data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: Very palatable, at least to horses, but, owing to its small size, local distribution and usual scarcity, it is one of the less important species of *Agropyron*.

Agropyron pseudorepens Scribn. & Smith

Western couch-grass

RANGE: From Brit. Col. and Alb. to e. Oreg. (there is, however, apparently no record of its collection on the Pacific coast or in Wash.) and to Utah, n. Ariz., w. Tex., Mo. and N. Dak.

DESCRIPTION: From 1 to 3 ft. high, somewhat decumbent at the base, characteristically with creeping rootstocks though these sometimes appear to be absent. Typically of a light green color; sometimes, however, stems and spikes are somewhat purplish. Leafy, usually growing in dense tufts or a continuous turf. Spike 3 to 8 in. long, rather narrow and erect, the spikelets crowded and roughish to the touch. The American equivalent of the well-known Couch-grass (*A. repens*) of Europe and Asia now widely naturalized throughout the U. S. and Can., from which it differs mainly in its harsher leaves, which are rough on both sides, more prominently veined and inrolled when dry; its narrower and more erect spikelets; unbearded or extremely short-bearded lemmas, and longer, narrower and more rigid leaves of the sterile shoots.

HABITAT: Usually found scatteringly in well-drained meadows, in rich river bottoms or in the open on elevated ground near creeks. According to Rydberg it occurs up to 6,700 ft. in Mont. and between 4,000 and 10,000 ft. in Colo.

FLOWERING PERIOD: July and Aug.

SEED DISSEMINATION: Middle of Aug. to Sept.

FORAGE VALUE: Much relished by cattle and horses; sheep are fond of the heads. A very nutritious grass as well, but not often abundant in any locality. One of

the most widely distributed of our native western *Agropyrons*; it has been submitted from all U. S. F. S. district except 5. A valuable constituent of native hay in many localities. Good characters of the species are indicated also in the numerous soft, leafy stems and root leaves that it produces and the large amount of seed.

***Agropyron repens* (L.) Beauv.**

Couch-grass

RANGE: A native of Europe and Asia, widely distributed in the U. S. and Can., especially in the Northeast, where it is often a common and troublesome weed. Its range appears to be steadily spreading, though it is still rare on the Pacific coast; it is doubtless found in nearly every State.

DESCRIPTION: A very variable species, of coarse habit, 1 to 4 ft. high, with long, bright yellowish-green scaly rootstocks. Stem leaves 5 to 7; all leaves thin with sparse hairs on the upper surfaces; characteristic clasping "hooks" at the throat of the leaf-sheaths. Spike 2 to 6 in. long, flattened; the spikelets about 5-flowered. Glumes strongly veined, sharp-pointed or tipped with a short bristle-like awn. Also known as Quack-grass and Dog-grass.

HABITAT: Common in fields, along roadsides and in waste places.

FLOWERING PERIOD: July to Sept.

SEED DISSEMINATION: Aug. to Oct.

FORAGE VALUE: Frequently a pernicious weed; it is not, however, without economic value. As a hay grass it is valuable for two or three years, but then "binds itself out." It is an excellent binder for railroad embankments. As a range forage plant it is sometimes important and is ranked as the 2d most valuable *Agropyron* in District 6. The rhizomes, known in the *Materia Medica* as "*Rhizoma* (or *Radix*) *graminis*," have medicinal value in kidney disorders. It is reported that about 250,000 pounds of the rootstocks of this grass, worth from 3 to 7 cents a pound are annually imported into the U. S. from Europe.

***Agropyron richardsoni* (Trin.) Schrad.**

Richardson's wheat-grass

RANGE: E. Que. to Yukon and Alaska, s. to n. Oreg., Colo., n. N. Mex. (where it is "rare"), Nebr., Iowa and Minn.

DESCRIPTION: Erect, smooth, 2 to 3 ft. high, with rather rough, erect leaves 3 1-2 to 8 in. long. Spike 3 to 8 in. long, the spikelets crowded, 3 to 5-flowered. Lemmas about 3-4 to 4-5 of an in. long, bearing straight awns often as much as 1.2 to 1.6 in. long. Very closely related to the common Bearded wheat-grass (*A. caninum*) from which it differs in its usually stouter, taller habit, larger, erect, usually 1-sided spikes and longer awns.

HABITAT: Dry or medium dry soils, on prairies, among bushes in the mountains, rather dry mountain meadows, sandy shores, etc., up to 10,000 ft. In Mont. (fid. Rydberg) it occurs on benchlands between about 3,300 and 6,700 feet.

FLOWERING PERIOD: June to Sept.

SEED DISSEMINATION: July to Oct.

FORAGE VALUE: Reported in several publications as being of value in meadows but only occasionally occupying any prominent place in them. It is reported from the Lewis & Clark N. F. as "probably good forage and of considerable importance on cattle ranges below 6,000 ft." The beards, of course, are apt to be injurious to stock.

***Agropyron riparium* Scribn. & Smith**

Streambank wheat-grass

RANGE: From n. e. Oreg., Idaho and Mont. to Wyo. and Colo.

DESCRIPTION: A whitish-colored bunchgrass, occasionally also stoloniferous, with stems 1 1-2 to 2 ft. high, erect from a somewhat bending base. Leaf-blades linear, tapering-pointed, flat at first and later becoming inrolled, rough throughout, 2 to

6 in. long. Panicle dense, 2 1-2 to 4 in. long. Spikelets 8 to 15, unawned or very short-awned, somewhat flattened and spreading, about 1-2 in. long, 5 to 7-flowered. Glumes 3-nerved, usually less than one-half as long as the spikelet; palea shorter than lemma. Often associated with *A. tenerum* which it somewhat resembles, but is lighter colored, sometimes stoloniferous, has shorter spikes and glumes that are noticeably shorter than the spikelets, instead of about two-thirds as long as the spikelets.

HABITAT: Stream and river banks, whence the Latin name *riparium*.

FLOWERING PERIOD: About June and July.

SEED DISSEMINATION: About Aug. and Sept.

FORAGE VALUE: No data available. It is probably never abundant on the range.

Agropyron scribneri Vasey

Scribner's wheat-grass

RANGE: From Idaho and w. Mont., where originally known, s. to Cal., Ariz. and N. Mex. Apparently absent from Wash. and Oreg.

DESCRIPTION: Densely tufted, 6 to 18 in. high, with somewhat spreading stems. Leaves short, flat, thin, mainly basal, rather rigid, narrowed at the end, about 1 to 2 in. long, the upper sheaths approximately thrice the length of the blades. Spike rather thick, disjointing and falling away on maturity, 1 to 3 in. long. Spikelets 3 to 6-flowered, the glumes often purplish, they and the lemmas terminating in rough, often purplish, horizontally spreading beards, 1-2 to 1 3-4 in. long.

HABITAT: Alpine, commonly above timber line, on rocky slopes, mostly between about 9,000 and 13,000 ft.

FLOWERING PERIOD: More data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: A palatable and nutritious grass, but it deteriorates with age on account of the awns. Its favorite habitat often precludes its utility as forage by making it practically inaccessible.

Agropyron smithii Rydb.

Bluestem

A. occidentale Scribn.

RANGE: One of the 5 most abundant and widely distributed of our native western Agropyrons. It has so far been submitted from 20 National Forests, including all districts except 5 and 6, where, however, it also occurs, the range being from Mich. through Man. and Sask. to Vancouver Island and s. to n. e. Cal. (Modoc Co.), Nev., Ariz., N. Mex., Okla., Kans. and Mo.

DESCRIPTION: Rigid, upright, whitish or bluish-colored, 1 to 5 ft. high, from creeping rootstocks. Leaves 4 to 8 in. long, rigid, upright, rough-margined and usually rough on the back. Spikes pale bluish color, full, straight, almost beardless, 2 to 6 1-2 in. long; spikelets much flattened, spreading, 7 to 13-flowered, about 1-5 to 2-5 of an inch distant. Glumes 1-2 to 2-3 as long as the spikelets, narrow; lemmas tipped with minute awns. Known also as Smith's bluejoint, Colorado bluestem and Western wheat-grass.

HABITAT: Often in alkaline situations, though it occurs on a great variety of soils. Most at home on drier bottom lands, though it grows freely on benchlands and open hillsides. Comparatively drought-resistant. On the yellow pine mesas of n. Ariz. between 5,500 and 7,500 ft. it is so abundant on large stretches of adobe soil that such areas are characterized as "bluestem range." In Colo. (fid. Rydberg) it occurs between 4,000 and 9,500 ft., and, according to the same authority, it is common on prairies, in meadows and valleys in Mont. up to about 6,700 ft.

FLOWERING PERIOD: July and Aug.

SEED DISSEMINATION: Aug. and Sept.

FORAGE VALUE: An important grass on spring, early summer and fall ranges almost throughout the West. Sheep are very fond of the heads. Reported from the Coconino and Tusayan National Forests as "one of the best forage plants on the range for all stock. It cures finely on the ground, making good winter range. Is found in large quantities and is often cut for hay."

The quality of the forage both for grazing and as hay is unsurpassed. Although the leaves are thick and rigid the plant rarely grows rank enough on the range to prohibit even sheep from doing well on it. The "bluestem hay," of which this species forms a major part, has a record for its high feeding qualities in Mont., Wyo., Colo., parts of Idaho, Utah and Nev.

As a range plant its advantages are: Wide distribution, drought resistance, palatable foliage remaining green throughout the greater part of the season, adaptability to alkaline soils, and growth from rootstocks. Its weak points are late maturity of seed, thus usually preventing their ripening before the plant is grazed off, and lack of abundance. While it grows on dry soils it rarely produces a dense stand except where there is abundance of moisture coupled with good drainage.

The disadvantage of maturing its seed late is far more real under range conditions than in meadows. On most open ranges where it occurs it is usually impossible to collect mature specimens except among small brush or on protected areas where stock cannot get at it.

Bluestem has been tried under cultivation at a number of State stations and by the U. S. Dept. of Agr. with moderate success. So far as known, however, seed is not on the market commercially and it is doubtful if it could be produced at a price which would justify its use on the open range. Results can be secured at present more economically by protection and natural reseeding.

For a chemical analysis of this species see Wyo. Expt. Sta. Bull. 70, pp. 11 and 12.

***Agropyron smithii molle* (S. & S.) Jones**

Alkali wheat-grass

A. spicatum molle Scribner & Smith

A. molle (S. & S.) Rydb.

RANGE: Wash. to Sask. and Mont., and s. to N. Mex.

DESCRIPTION: A variety of bluestem (*A. smithii*) from typical forms of which it is distinguished by its softer leaves and the fact that the spike axis and the lemmas are very downy, instead of smooth. Also known as Soft western wheat-grass and Woolly bluestem.

HABITAT: In dry, usually alkaline soils. It occurs between 5,000 and 9,000 ft. in Colo. (fid. Rydberg); "rather rare" in Mont., according to the same authority.

FLOWERING PERIOD: About the same as the species.

SEED DISSEMINATION: About the same as the species.

FORAGE VALUE: This variety is of rather coarse habit, but it is a valuable forage plant because of its ability to grow in places where few other grasses or, in fact, forage plants of any description will grow.

***Agropyron spicatum* (Pursh) Scribn. & Smith**

Blue bunch wheat-grass

A. divergens Nees

A. spicatum (Pursh) Rydb.

RANGE: Alaska, Brit. Col., e. Wash., e. Oreg., Idaho and Mont., through Utah, Wyo. and Colo. to N. Mex. Possibly also in Ariz. Occasionally reported as occurring in Cal., but there appears to be no authentic record of its having been collected in that State. There is no specimen of it in the U. S. National Herbarium from Cal., and no Flora of that State, including Jepson's, issued in 1912,

lists this species. One of the most widely distributed of our native western Agropyrons; it has so far been submitted for identification from 20 National Forests, representing all districts except 3 and 5, and it undoubtedly occurs in the former. Known also as Blue bunchgrass, Wiry wheat-grass and Western wheat-grass.

DESCRIPTION: A bunchgrass, without rootstocks, having slender, usually bluish-colored stems; in arid sites rarely over 12 to 18 in. high, but attaining a height of about 3 ft. on rich soils. Leaves smooth but slightly hairy above, very narrow, usually rolled, pointed, spreading, numerous, light blue in color. Spikes slender, 2 to 4 in. long, the axis continuous so that the spike does not disjoint and fall away on maturity. Spikelets flattened, long, narrow, remote, erect or spreading, 3 to 6-flowered, about 4 to 12 in number. Glumes sharp-pointed but unbearded; lemmas terminate typically in stout, often twisted awns, spreading at wide angles, 1-2 to 1 in. long, although there are unbearded varieties.

HABITAT: On "dry hills and mountains, between 5,000 and 6,000 ft." in Colo., and is "common up to 8,300 ft." in Mont. In e. Wash., it forms almost pure stands in the so-called "bunchgrass prairies" of the Columbia Basin, which are of basaltic nature except in a few valleys which are of glacial origin. Common in dry sandy loam soils on open-timbered sunny hillsides, between about 5,000 and 8,500 ft., most commonly on w. slopes. Not found in wet areas or in very dense timber.

FLOWERING PERIOD: Latter part of June to middle of Aug.

SEED DISSEMINATION: Aug. to latter part of Sept.

FORAGE VALUE: One of the most important of all our native Agropyrons. It is ranked first among forage grasses in District 6. The awns are apt to be troublesome and the stems, especially in arid areas, tend to become wiry and unpalatable with age; these disadvantages, however, are offset by many excellent qualities. It is probably of greater economic importance in the yellow pine belt of Oreg., Wash., Mont. and Idaho than elsewhere, although it occurs frequently throughout the yellow pine belt except in the Southwest. On the open dry hills and openly timbered hills of n. e. Oreg., it frequently forms the bulk of the forage on spring, fall and early winter ranges, and a good portion of the summer grass forage of ranges within the yellow pine belt.

As a range forage it is excellent for cattle, horses and sheep, except where not grazed for a year or two so that the old growth near the ground is rank and tough. Sheep then leave it for more tender foliage. The abundance of leaves both at the base and on the stems make it a heavy producer per individual plant. It seldom, however, forms more than a 6-10 ground cover. Occasionally it forms part of a hay crop on bench lands, but such cases are rare. It has been tried to a limited extent under cultivation with moderate success.

The foliage remains green well through the season and is nutritious and palatable after growth ceases. For this reason it is an especially valuable plant on spring, fall and early winter ranges. Where it occurs in greatest abundance snow is usually too deep for mid-winter grazing.

Its advantages as a range forage plant are: Its occurrence on dry, rocky hillsides where other grasses are not abundant, the large amount of tender foliage per individual plant, palatability of foliage both when green and cured, distribution on early and late ranges where other palatable grasses are frequently scarce. Its shortcomings are: Comparatively limited abundance throughout its range, failure to produce a heavy stand, production of a small, often late-maturing seed crop. It usually produces flower stalks well on in the season. The stalks at no time are abundant and the seed of those produced late does not mature on account of frost. For this reason it can not be expected to reproduce itself from

seed unless given ample protection from grazing during the early growing season up to about Aug. 1 to 15 in its range.

Agropyron spicatum inerme (S. & S.) Heller Unbearded bunch wheat-grass
A. divergens inerme Scribner & Smith

RANGE: From Brit. Col. to Oreg., Idaho and Utah.

DESCRIPTION: Differs from typical forms of Blue bunch wheat-grass (*A. spicatum*) in its more slender and more tufted stalks, its bristle-like, convolute leaves and blunt or else short-awned lemmas; the spikelets break up shortly after flowering.

HABITAT: About the same as the species.

FLOWERING PERIOD: About the same as the species.

SEED DISSEMINATION: About the same as the species.

FORAGE VALUE: About the same as the species.

Agropyron spicatum molle Scribn. & Smith. See *A. smithii molle* (S. & S.) Jones.

Agropyron spicatum palmeri Scribn. & Smith. See *A. palmeri* (S. & S.) Rydb.

Agropyron spicatum tenuispicum (S. & S.) Rydb. Slender-spiked wheat-grass
A. divergens tenuispicum Scribner & Smith

RANGE: About the same as the species.

DESCRIPTION: This variety is distinguished mainly by its flat leaf-blades, which become inrolled with age; its flexuous slender spike, 3 to 6 in. long; smaller spikelets and very much shorter awns, the latter sometimes being reduced to small bristles.

HABITAT: About the same as the species.

FLOWERING PERIOD: About the same as the species.

SEED DISSEMINATION: About the same as the species.

FORAGE VALUE: About the same as the species.

Agropyron subvillosum (Hook.) E. Nels. Small wheat-grass
A. dasystachyum subvillosum (Hook.) Scribn. & Smith
Triticum repens subvillosum Hooker

RANGE: Alaska and Yukon s. to n. e. Cal. (Lassen Co.) and Colo.

DESCRIPTION: A light green or somewhat bluish grass, with slender stems usually about 8 to 16 in. high, but sometimes as much as 3 ft. high, from creeping rootstocks. Lower sheaths and upper surfaces of the blades smooth or finely pubescent; blades narrow, mostly inrolled, rough below, 1 3-5 to 7 1-5 in. long. Spikes erect, 2 to 6 1-2 in. long, the spikelets more or less rounded, about 1-2 in. long, rather few-flowered, 1-6 to 1-2 in. distant. Glumes 1-3 to 1-2 as long as the spikelet, tapering-pointed, lance-shaped, with rough margins, pubescent or nearly smooth. Lemmas sharp-pointed or very short-awned, rough-hairy, presenting the "subvillous" appearance alluded to in the scientific name. Differs from *A. dasystachyum* in being more slender and having shorter and more crowded spikes and shorter spikelets, and from *A. repens* or common Couch-grass in its densely pubescent lemmas and the usually hairless or nearly hairless glumes.

HABITAT: Plains, benchlands and well-drained meadows, usually in sandy soils. In Mont. (fid. Rydberg) it occurs up to about 6,700 ft.

FLOWERING PERIOD: More data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: Owing to the fineness of the herbage and characteristic low stature this species is one of the most palatable of the Agropyrons to sheep. It is not often abundant, however, in any one locality.

Agropyron tenerum Vasey

Slender wheat-grass

RANGE: Nfd. and Lab. to Alaska and s. to N. E., Mo., Kans., Colo., N. Mex., Ariz. and Cal., extending into n. Mex. at least in Lower Cal. and Chihuahua. The most widely distributed of our native Agropyrons. It has so far been submitted for identification from 43 National Forests and is the only one that has come in from all 6 districts.

DESCRIPTION: A usually greenish-colored bunchgrass, without rootstocks, having slender stems 20 to 40 in. high, the joints frequently dark-colored. Leaves rough, 3 to 8 in. long, flat or inrolling, usually narrow. Spike loose, narrow, slender, cylindrical, green, 3 to 8 in. long, the spikelets rather distant. Glumes 2-3 as long as or equaling the spikelet, almost always broadest below the middle; lemmas blunt or ending in a very short awn.

HABITAT: More common in dry mountain meadows than any other wheat-grass. Typical of river bottoms, mountain valleys and medium moist, well-drained situations throughout the yellow pine and most of the lodgepole pine belts. Its best growth conditions are about the same as those of timothy, but it withstands alkali better than timothy. On the Medicine Bow N. F. it is found at elevations of 7,000 to 8,500 ft., often in shaded areas under lodgepole as well as in dry open prairies. On the Coconino N. F. it occurs usually in parks in the Y. P. type, between 4,000 and 7,500 ft. On the Caribou N. F. it occurs between 4,000 and 7,500 ft. in open weed and grasslands and to a more limited extent in sagebrush areas in a well-drained dark moist loam. On the Manti N. F. it has a scattering growth, in well-drained park areas in full sunlight. On the Shasta N. F. it is rather common at about 4,000 ft. on the porous volcanic soil of the plains e. of Mt. Shasta in the Y. P. type.

FLOWERING PERIOD: May to Aug. (depending on latitude).

SEED DISSEMINATION: Early June to late Sept. (depending on latitude).

FORAGE VALUE: Excellent for cattle and horses and fair for sheep; sheep are fond of the heads. When cut and cured it makes very good hay. Attempts have been made to use it in reseeding depleted grazing lands but with only moderate success. It has, however, been grown more extensively under cultivation and with uniformly better results than any other *Agropyron* and it is probably the only species of the genus for which seed is occasionally on the market. It is better suited to cattle and horses than to sheep for the reason that it begins growth early and matures early. By the time sheep reach the open range where it occurs most abundantly it has usually reached an advanced stage and they waste a good portion of it in looking about for more tender feed. In late summer, however, they eat the grain and when mixed with other more succulent feed it aids in putting on a hard substantial fat. Cattle and horses eat the entire plant and do well on it. It is more frequently cut for hay than any other wheat-grass, for the reason that it has a wider distribution in native hay meadows than any other, and produces a heavier crop. On well drained, irrigated soil it produces as heavy a crop as timothy and is usually considered equal to timothy in palatability, although this is perhaps somewhat doubtful because the proportion of foliage to stems is hardly as great. In nutritive qualities it surpasses timothy.

As a range forage grass its points of superiority are: Wide distribution, early growth, early maturity, and good crop of viable seed, palatability and nutritiousness. Its disadvantages are: Its limitation to fairly good soils of medium moisture content and its failure to produce a heavy stand without cultivation and moderate irrigation.

Agropyron vaseyi Scribn. & Smith

Vasey's wheat-grass

RANGE: Wash. to Alb. and Mont. and s. to n. e. Cal., Nev., Utah and Colo. Also N. Mex. (?)

DESCRIPTION: A bunchgrass, without rootstocks, 1 to 3 ft. high, with smooth, slender, light green stems. Leaves narrow, usually inrolling, erect, smooth, light green. Spike continuous, not breaking up at maturity, slender, 2 to 4 in. long. Spikelets compressed, remote, erect; glumes thin, unawned; lemmas terminating in slender, finally horizontally spreading awns about 3-4 in. long. It differs from the common Blue bunch wheat-grass (*A. spicatum*) in its shorter and narrower leaves, more rigid and wiry stalks and smaller spikelets.

HABITAT: Dry hills or mountains at medium elevations.

FLOWERING PERIOD: June and July.

SEED DISSEMINATION: Aug. and Sept.

FORAGE VALUE: Palatable to all classes of stock, especially horses and cattle. It readily shows the effects of abusive range handling, but has fairly strong seed habits. It usually is very limited in abundance.

Agropyron violaceum (Hornem.) Lang.

Violet wheat-grass

A. biflorum (Brign.) R. & S. as to its western range.

RANGE: Owing to nomenclatorial differences the range of this species is somewhat in dispute. It is now regarded, however, by the best authorities as the western equivalent of the eastern and European, Two-flowered or Purplish wheat-grass (*A. biflorum*), which ranges from the Arctic Circle s. to N. S. and also in the White Mts. of N. H., the Adirondack and Catskill Mts. of N. Y., and in the Alleghenies of Pa., extending w. to the shores of Lake Superior. This species may be considered as ranging through n. Asia and in N. Am. from Alaska to Brit. Col. and n. e. Oreg. and s. in the Rocky Mts. as far as n. Ariz.

DESCRIPTION: Smooth, 6 to 24 in. high, the stems usually slightly reclining at the base. A rather stout, tufted, fibrous-rooted grass, without rootstocks. Leaves very few, flattened, broad, 2 to 6 in. long, usually not rigid, rough or sometimes smooth beneath, the sheaths usually not reaching the joints of the stem. Spike dense, 1 to 4 in. long, rather thick, violet or purple in color, due to the glumes. Spikelets 3 to 5-flowered; glumes short-awned, usually broadest above the middle and rather thin; lemmas tipped with short, weak, usually purplish awns.

HABITAT: Dry sandy loam soils, usually in parks or open forests, subalpine to alpine elevations, between 6,500 and 12,000 ft. in Colo.

FLOWERING PERIOD: June to about middle of Aug.

SEED DISSEMINATION: Latter part of Aug. to Sept.

FORAGE VALUE: Wherever occurring in appreciable quantities a very valuable constituent of the forage, being highly palatable to all classes of stock. Unfortunately, however, it is ordinarily very sparsely distributed on the range. For a chemical analysis of this species see Wyo. Expt. Sta. Bull. 70, p. 16.

AGROSTIS

The *Agrostideae* or Redtop-Timothy tribe of the Grass family, next to the *Festuceae* or Fescue-Bluegrass-Brome tribe the largest main division of that family, as well as the term "agrostology," the branch of botany dealing with grasses, get their names from the genus *Agrostis*.

It is a large genus of world-wide distribution composed of approximately 100 species, best represented in n. Asia and Europe. About 40 species occur in N. Am., where the genus is essentially Pacific and northwestern, Cal. and Oreg. with 18

species each, being the center of distribution. Wash. has 14 species, Brit. Col. 11, Mont. 7, and Alaska, Colo. and N. Mex. 6 each. Four species are each confined to a single State, viz.: *A. exigua* and *A. lepida* in Cal. only; *A. howellii* in Oreg. and **A. rosei*, an exceedingly rare species, known so far in the U. S. from one locality only in N. Mex., although subsequently once collected in the State of Zacatecas, Mex.

This genus is characterized as follows: Usually perennial, sometimes annual with smooth slender stalks and quite diverse in habit, being low or tall, erect, bent at the base or creeping, tufted "bunchgrasses" or having stolons or rootstocks and forming a complete turf. The leaf-blades may be flat or inrolled but are usually rough; the leaf-sheaths are usually channeled and often rough. The inflorescence is in the form of terminal (occasionally also from the axils of the leaves) panicles, which may be open with widely-spreading hair-like branches, or contracted, or even very narrow and spike-like. The spikelets are small and 1-flowered; the glumes are of equal length or nearly so, sharp-pointed, very rarely short-awned, and persist, except in very rare instances, when the rest of the spikelet drops off, the spikelets being articulated above them. The lemma is shorter than the glumes, very thin in texture, and either unawned or else with an awn from the back, below the apex, somewhat as in the Oat tribe, members of which, however, never have 1-flowered spikelets. The grain is free, but is sometimes enclosed by a thin scale, opposite the lemma, known as the "palea" or "palet"; this organ is smaller than the lemma, and is often very minute or else may be entirely absent.

Agrostis differs from the closely related genus *Calamagrostis* in that the latter is a group of coarse grasses which have much larger spikelets, thicker stalks, and a conspicuous tuft of hairs at the base of the lemma.

All species of *Agrostis* for which notes are given here are perennials.

***Agrostis aequivalvis* Trin.**

Alaskan redtop

RANGE: Originally known from Alaska; its recognized range now includes also adjacent Brit. Col., Wash. and n. e. Oreg. It does not occur in Cal.; the plant which the books refer to under this name as growing in that State is, in reality, another species, *A. thurberiana*. Reported also as occurring in Lab. and it may be that it ranges in the far North, in territory which is practically unexplored botanically, clear across the continent. It probably occurs in Idaho and, by Rydberg, is reported to be "a very rare grass in Mont."

DESCRIPTION: A smooth, slender, tufted grass, 6 to 24 in. high. Blades narrowly linear, upright, somewhat rough; stem leaves usually 1 or 2, erect, ordinarily 1 1-2 to 2 1-2 in. long. Panicle open, about 2 to 5 in. long, the branches slender and roughish. Spikelets relatively few, usually purplish. Glumes smooth or nearly so; palea almost as long as the lemma opposite it. An interesting species botanically in that it has 2 characters very unusual in this genus: (1) the spikelet axis is prolonged behind the palea into a minutely pubescent rudiment nearly half as long as the palea, and (2) the lemma is just about as long as (instead of shorter than) the glumes. It is an intermediate form between the genera *Agrostis* and *Calamagrostis* and, by some authors, has been erected into a distinct genus named *Podagrostis*.

*Officers of the Chiricahua N. F. should be on the lookout for this species, since it was collected (in 1892) by Mearns at Cloverdale, Grant County, in or near that Forest.

HABITAT: Marshes, swamps, moist meadows and the like. On the Wallowa N. F. it occurs from "6,000 to 8,000 ft. elevation, in the open grass-weed types. Frequent in the grass types at heads of streams."

FLOWERING PERIOD: More data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: Reported from the Wallowa N. F. to be "grazed by sheep during early summer; 95 per cent palatable to this class of stock."

***Agrostis alba* Linn.**

Redtop

RANGE: A native of Europe and northern N. Am., extending s. in the mountains. Escaped from cultivation it has made itself at home over practically all of the U. S. and Can., though rather rare in the extreme southern States. Prof. Hitchcock considers that it is not native to Cal. With *A. exarata* and *A. hiemalis* it is one of the 3 most common species of *Agrostis* on National Forests and has been submitted for identification from all districts.

DESCRIPTION: A variable grass in appearance, with extremes in height of about 8 in. and 5 ft., the average height being about 1 to 3 ft. Stems erect or else bent just above the rootstocks, from which fact such forms are frequently known as "bent-grass" or "creeping bent"; from the base are sent out running rootstocks which root and send up new stalks. Leaf-blades usually numerous, rough to the touch, varying in width with the vigor of the plant, sometimes flat, stiff and upright and sometimes lax, spreading and partly twisted. At the base of the blade, between it and the stalk, is the usually conspicuous "ligule" or tongue-like projection of the lining of the leaf-sheath. Panicle 2 to 12 in. long, of a characteristic reddish purple color, loose but not with the branches widely spreading, except in the variety *A. alba vulgaris*, branches easily seen, ascending, slightly roughened, the lower ones in whorls. Spikelets not crowded; glumes sharp-pointed, rough on the keel but not on the back; lemma blunt or rarely short-awned; palea 1-2 to 2-3 as long as the lemma. Called Fiorin in England.

HABITAT: Wet meadows and pastures. Does well also when mixed with other grasses on drier soils. Endures acid soils better than any other of the well-known forage plants. According to Wooton and Standley its best growth in N. Mex. is above 7,000 ft.; according to Rydberg it occurs in Colo. between about 4,000 and 8,500 ft. and in Mont. up to about 7,000 ft.

FLOWERING PERIOD: July to Sept.

SEED DISSEMINATION: Early Aug. to early Nov.

FORAGE VALUE: Highly palatable, nutritious and readily grown this grass, long cultivated, occupies high rank as a forage plant. Two varieties of it are among the most valuable of all lawn-grasses.

***Agrostis alba vulgaris* (With.) Thurb.**

Small redtop

A. vulgaris Withering

RANGE: A native of Europe, Alaska, Can., northeastern Rocky Mts., and northwestern States. It is commonly cultivated, and, as it escapes widely and intergrades freely with other forms of redtop, its exact range is difficult to define.

DESCRIPTION: Often tufted, the rootstocks short or absent; stalks 6 to 18 in. high, upright, more slender and lower than the species. Blades short, narrow, ascending. Thurber says of this grass: "In most works *A. alba* and *A. vulgaris* are kept distinct, perhaps from the fact that they are recognized as different in agriculture, the only botanical character that can separate them being the difference in length of ligule" (see preceding notes for *Agrostis alba* as to "ligule" of that species). In the typical forms of the species the ligule is long and sharp-pointed; in this variety it is short and squared at the top. In the variety also the

panicle is open, smaller, not contracted after flowering, the branches few and spreading. Known also as Fine-bent and Herd's-grass.

FLOWERING PERIOD: Reported to be late July to forepart of Sept., Manti N. F.

SEED DISSEMINATION: Reported to be late Aug. to about Oct. 1, Manti N. F.

FORAGE VALUE: Reported from the Manti N. F. to be "an excellent forage grass, especially relished by horses and cattle." Quoted in seed catalogues as a distinct species, being recommended, especially in mixtures with timothy and red clover, for sowing permanent pastures.

***Agrostis ampla* Hitchc.**

Pacific redtop

RANGE: From Vancouver Island and s. Brit. Col. through Wash. and Oreg. to Cal.; also in the Santa Rita Mts. of Ariz.

DESCRIPTION: A bunchgrass, without rootstocks, with erect stems, 2 to 3 ft. high, from a slightly decumbent base. Leaves mostly basal, pale green, broad, about 1-5 to 1-3 of an in. wide. Panicle large and more or less spreading, 6 to 10 in. long, almost white when mature, the branches in whorls, the shorter ones spikelet-bearing practically to the base. Glumes tapering, unequal in size; lemma about 5-8 as long as the lowest glume, bearing a straight or bent awn; palea reduced to a minute nerveless scale.

HABITAT: Type specimen collected on "wet rocks"; prefers medium moist soils; usually at low elevations near the coast or in interior valleys.

FLOWERING PERIOD: More data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: Reported to be "grazed by all classes of stock with fair relish." Further observations desirable.

***Agrostis asperifolia* Trin. See *A. exarata* Trin.**

***Agrostis exarata* Trin.**

Spiked redtop

includes *A. asperifolia* Trin.

also *A. grandis* Trin.

and *A. scouleri* Trin.

RANGE: Widely distributed in w. N. Am. from the Aleutian Archipelago through s. and s. e. Alaska, Brit. Col., Alb., Sask. and Man., e. as far as Wis.(?) and centr. Nebr., and s. to Cal. and w. Tex. In the mts. it occurs through practically the whole length of Mex. It is one of the 3 most common species of *Agrostis* on National Forests and has been submitted from all districts.

DESCRIPTION: An erect tufted grass, without rootstocks, usually 1 to 2 1-2 ft. high, but sometimes greatly dwarfed or as much as 4 ft. high. Leaves narrow, roughish, usually flat, frequently mainly basal, about 1 to 4 in. long, occasionally as much as 8 in., usually pale green but sometimes a deep bluish green. Panicle 2 to 10 in. long, contracted, typically very much so, becoming spike-like, the branches short, erect or ascending and densely-flowered, either green or reddish purple in color. Glumes rough on the keel; lemma about 2-3 as long as the spikelet, unawned or else with a very short prickle on the back; palea reduced to a minute nerveless scale. A variable species, so that it is only within recent years that agrostologists have come to regard it as one species composed of a number of different but intergrading forms. Pacific forms are apt to be taller, more robust and more often with the panicle inclined to be purplish. Southwestern forms are apt to have very rough and inrolled leaves. The eastern forms perhaps have a greater tendency toward opening out of the panicle.

HABITAT: Very common along streams and in more or less moist parks, meadows and open willow areas. It is especially common in Cal. near the seacoast, but

occurs in the mts. up to about 9,000 ft.; in Colo. (fid. Rydberg), it occurs between about 4,000 and 10,500 ft., so that there are relatively few parts of the State in which it may not be found.

FLOWERING PERIOD: From June to Sept., varying with its great altitudinal and latitudinal range. On the Manti N. F. July is considered to be the height of this period.

SEED DISSEMINATION: July to Oct. On the Manti N. F. this is reported to be from about the middle of Aug. to early Sept. On the Shasta N. F. it is from the latter part of July to late Aug.

FORAGE VALUE: Palatable to all classes of stock, especially cattle and horses. In some localities this grass supplies the bulk of the forage and it remains green until the season is well advanced. Its forage value necessarily varies somewhat in different localities but, in general, it may be stated that this is one of the most important of our native species of *Agrostis* and it is considered by experts to be a very promising species for cultivation although few, if any, attempts have been made to cultivate it.

***Agrostis foliosa* Vasey**

Leafy redtop

A. pallens foliosa (Vas.) Hitchc.

RANGE: From Brit. Col. through Wash., Idaho and w. Mont. to Cal.

DESCRIPTION: Stems erect or nearly so, 12 to 24 in. high, usually rather stiff or in the slender forms wiry, sometimes small and delicate, more or less tufted in appearance but provided, nevertheless, with creeping rootstocks. Leaves long, flat, narrow and rather stiff. Ligule, tongue-like projection of the inner lining of the leaf-sheath, very conspicuous, with a characteristic lacerated appearance. Panicle usually pale green, sometimes purplish, 3 to 12 in. long and open, but narrow, the branches stiff and more or less ascending, many of the longer branches bare on the lower portion. The Cal. specimens are almost invariably awnless; other specimens frequently show a short and straight or rarely bent awn. This species differs from *A. pallens* in having taller stems and more open panicles, the branches of which are stiffly ascending. Also known as Thin-grass.

HABITAT: Along moist creek bottoms, moist and wet meadows and in open woods. Not found in dry parks or well-timbered range.

FLOWERING PERIOD: July and Aug., Deerlodge N. F.

SEED DISSEMINATION: Middle of Aug. to Sept., Deerlodge N. F.

FORAGE VALUE: While palatable to all classes of stock, especially cattle and horses, it is ordinarily so sparsely distributed on the range as to be practically negligible.

***Agrostis geminata* Trin.** See *A. hiemalis geminata* (Trin.) Hitchc.

***Agrostis grandis* Trin.** See *A. exarata* Trin.

***Agrostis hallii* Vasey**

Hall's redtop

RANGE: Oreg. and Cal., near the coast, at least, not known from the Sierras.

DESCRIPTION: With rootstocks; the stems stout, leafy and erect, 2 to 3 ft. high. Leaves 4 to 6 in. long, narrow; the ligule or papery tongue-like projection of the inner lining of the leaf-sheath conspicuous and more or less cleft at its apex. Panicle reddish-purple, 4 to 5 in. long, open, narrow or moderately spreading, the branches ascending and flexuous. Spikelets unawned; glumes tapering-pointed; lemma with a conspicuous tuft of hairs at its base and about half its length, in which respect, this species agrees with *Calamagrostis* and, but for its aspect,

would doubtless be included in the latter genus. Palea wholly absent in this species.

HABITAT: Mostly in moist woods.

FLOWERING PERIOD: More data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: Reported from the Trinity N. F. to be "very good for all classes of stock."

Agrostis hiemalis (Walt.) B. S. P.

Winter redtop

RANGE: In the more elevated portions of the N. Am. continent, occurring from Lab. to Alaska and from Fla. to Cal.; also in Mex. It is one of the five most abundantly distributed grasses on National Forests and has been submitted for identification from all districts and 53 National Forests.

DESCRIPTION: An erect, slender, tufted, fibrous-rooted grass, exceedingly variable in appearance, 8 in. to 3 ft. high, but usually about 18 in. high. Leaves usually slender, sometimes even bristle-like, about 2 to 5 in. long, relatively few, mostly basal, the basal ones usually soon becoming inrolled. Panicle characteristically very diffuse and open, 3 to 12 in. long, usually purplish, occasionally compact, often drooping, the branches thread-like, rough, weak, 3 to 4 in. long; the spikelets crowded toward their tips. Glumes sharp-pointed or even bristle-tipped; lemma 2-3 or 3-4 as long as glumes, awnless or rarely awned; palea wanting. In the White Mts. of N. H. occurs a peculiar form of the species with awned spikelets, more tufted, and with numerous short basal leaves, which, however, the best authorities do not consider entitled to specific or even varietal rank.

HABITAT: Common along creeks, in dry to moist open woodlands, in sandy lowlands, and among rocks; to a slight extent, in open dry park areas, but not in dry timbered range. Especially characteristic of the higher and cooler mts. Between 4,000 and 11,000 ft. in Colo. In the Y. P. type of the Coconino N. F. it is found usually in moist flat areas or along partly shaded streambeds.

FLOWERING PERIOD: June to Aug. in the n. e. States; July to Sept., Medicine Bow N. F.; Aug and Sept., Coconino N. F., and July, Manti N. F.

SEED DISSEMINATION: Aug. and Sept., Medicine Bow N. F.; Sept. and Oct., Coconino N. F.; Aug. 15 through Sept., Manti N. F.

FORAGE VALUE: The large ratio of seed-head to foliage prevents this species from being considered, despite its abundance, an important forage plant; some forms of it are eaten with a limited degree of relish, but, on the whole, it occupies an inferior position among the redtops. Reported from the Medicine Bow N. F. to be "grazed very little except early in the season," and, from the Coconino N. F., to be "eaten to some extent but not an important forage plant." On the Manti N. F. "observed on a cattle and sheep range. Neither class of stock seemed to care for this grass, leaving it practically untouched."

Agrostis hiemalis geminata (Trin.) Hitchc.

Alpine winter redtop

A. geminata Trinius

RANGE: From the Aleutian Archipelago through Alaska to Cal. and Colo.

DESCRIPTION: Differs from typical *A. hiemalis* in being usually less than a foot high and in having a smaller, less diffuse panicle with spreading branches; the lemma, except for the Cal. specimens, has usually a slender straight awn about as long as itself.

HABITAT: Arctic and subalpine to alpine regions.

FLOWERING PERIOD: More data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: Reported from the Medicine Bow N. F. to be "good forage, but unimportant due to lack of abundance." On the Eldorado N. F. this variety is often an important constituent of the high range forage crop and is grazed by both cattle and sheep; it is, however, noticeably inferior to *A. exarata* with which it is commonly associated.

***Agrostis idahoensis* Nash**

Idaho redtop

RANGE: From Wash. and Mont. to Cal. and N. Mex. Known originally from Idaho, on or near what is now the Nezperce N. F.

DESCRIPTION: A delicate tufted fibrous-rooted grass, with erect slender stems 3 to 12 in. high. Leaves very narrow, 1 to 3 in. long. Panicle slender and rather compact or else loosely spreading, often dark purple, 1 to 4 in. long, the branches thread-like, roughish, about 1 or 2 in. long. Lemma unawned and palea minute. Differs from *A. hiemalis* in being stiff and erect and having a narrow panicle with shorter branches. Also known as Tickle-grass and Hair-grass.

HABITAT: In mt. meadows and other moist situations, frequently in timbered localities. Occurs from 7,000 to 12,000 ft. in Colo. "A rare high mt. species in N. Mex."

FLOWERING PERIOD: Aug. 15 to Sept. 15, Medicine Bow N. F.

SEED DISSEMINATION: Sept., Medicine Bow N. F.

FORAGE VALUE: Reported from the Medicine Bow N. F. to be too sparse to be important. Further notes are needed concerning the forage value of this rather widely distributed species.

***Agrostis microphylla* Steud.**

Small-leaved redtop

RANGE: A Pacific species, ranging from Brit. Col. to Lower Cal. In Cal. it occurs along the coast and, in the Sierra Nevada, from Yosemite Nat. Park southward.

DESCRIPTION: A bunchgrass, without rootstocks, variable in appearance, 1 1-2 to 3 ft. tall or often greatly dwarfed. Leaf-blades flat, roughish, usually narrow and typically small, but sometimes much elongated. Panicle narrow and spike-like or else rather loose, 4 to 12 in. long, the branches spikelet-bearing nearly to the base. Glumes awn-pointed; lemma 1-3 shorter than glumes, bearing from the middle of its back a protruded bent awn; palea wanting.

HABITAT: Prairies, dry hills and open woods.

FLOWERING PERIOD: More data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: More data needed.

***Agrostis oregonensis* Vasey**

Oregon redtop

RANGE: Wash., Oreg. and Idaho. Originally known from Mt. Hood, Oreg. A specimen collected by Tweedy on the Teton N. F. in Wyo. has been tentatively referred here by Prof. Hitchcock.

DESCRIPTION: Slender-stemmed, without rootstocks, 1 to 2 ft. high. Leaves mainly basal, about 2 to 4 in. long, the uppermost one usually the longest, narrow, flat and slender-pointed. Panicle somewhat pyramidal, narrow, nodding, dark purple, the lower branches in 3's to 5's, 1 1-2 to 2 in. long, erect or ascending. Spikelets have roughish pedicels; in some specimens, including the type, the spikelet is jointed below the glumes so that the entire spikelet falls off together, a very unusual feature not only in this genus, but also in the Redtop-Timothy tribe and, in fact, the whole subfamily *Poaceae*.

HABITAT: Moist to wet situations in the mts.

FLOWERING PERIOD: More data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: Reported from the Clearwater N. F. to be "relished by horses"; presumably palatable to cattle as well. Further notes are desired.

***Agrostis pallens* Trin.**

Seashore redtop

RANGE: Wash. and Oreg. to Cal. as far as San Francisco Bay.

DESCRIPTION: Stems erect, 8 to 16 in. high, from creeping rootstocks. Blades erect, flat, medium broad, 4 in. long and rather rough. Panicle contracted, almost spike-like, about 2 to 4 in. long. Spikelets unawned and usually purplish; lemma a little shorter than the glumes, awnless, with minute hairs at the base; palea typically absent or sometimes present but very much reduced. Also known as Pacific redtop.

HABITAT: Typically on sandy seashores. Apparently unknown from interior Cal., but has been collected on the Ochoco N. F.

FLOWERING PERIOD: More data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: Further notes are needed; it is reported to be eaten readily by horses and cattle along the seacoast.

***Agrostis pallens foliosa* (Vas.) Hitchc. See *A. foliosa* Vasey.**

***Agrostis rossae* Vasey**

Alpine redtop

RANGE: From Wash., Idaho and w. Mont. s. to Cal., Nev., Utah and Wyo. There seems to be no record of its occurrence in Colo.

DESCRIPTION: Tufted, without rootstocks; stems rather stout, 4 to 8 in. high, rarely taller. Leaves mostly basal, very narrow, flat or folded, the sheaths conspicuous, for the most part between 1 and 3 in. in length. Panicle contracted, about 1 to 3 in. long, green or purplish; spikelets smooth; glumes noticeably unequal; lemma awnless, with a few short hairs at base; palea minute. This species differs from *A. exarata* chiefly in size and Prof. Hitchcock states that it may possibly prove to be an alpine form of that species; the glumes are not rough on the back as is usual in *A. exarata*. Also known as Ross' redtop and Dwarf redtop.

HABITAT: Typically an alpine plant; on the Minam and Wallowa National Forests it is not seen below about 6,500 ft., being common, especially on basaltic soils, about 7,000 ft. on grassy slopes, associated with *Festuca viridula* and *Poa arctica*, and also occurring along rocky creeks and slopes in the lower Arctic Zone. In Cal. it is confined to the high Sierra Nevada.

FLOWERING PERIOD: From the middle of July to the middle of Aug., Wallowa N. F.

SEED DISSEMINATION: From late Aug. to middle of Sept., Wallowa N. F.

REPRODUCTION: Tests made on the Wallowa N. F. showed the viability of the seed to be above the average for an alpine species; three tests gave an average of 36.0 per cent germination.

FORAGE VALUE: Palatable to all classes of stock, but ordinarily is too high to be utilized by cattle. Although not producing much leafage per plant the foliage is tender, remains green until late in the season, and the grass is frequently a very important constituent of the forage crop on high sheep ranges.

***Agrostis schiedeana* Trin.**

Mexican redtop

RANGE: From Brit. Col. through Cal. and Nev. to s. Mex. Originally known from Mex.

DESCRIPTION: A bunchgrass, without rootstocks, having tufted slender stems 1 to 2 ft. high. Leaves flat, narrow, 3 to 6 in. long. Panicle elongated, loose, but

not greatly spreading, 4 to 12 in. long, the branches in whorls, rather stiff and ascending, numerous below, the longer branches 2 to 4 in. long, branching again above the middle and naked at the base. Glumes about 3-4 longer than lemma; lemma awnless; palea small, about 1-3 as long as lemma. Sometimes called Tickle-grass.

HABITAT: Moist to wet soils. Characteristic of wet meadows in the high mts.

FLOWERING PERIOD: More data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: Good forage, especially for cattle and horses, in the forepart of the season before it heads out.

Agrostis scouleri Trin. See *A. exarata* Trin.

Agrostis stolonifera Linn.

Creeping redtop

A. verticillata Vill.

not "*A. alba stolonifera*" of some writers, the familiar "Creeping bent" of lawns.

RANGE: Introduced from Europe. Common in the warmer regions of the Old World from France to India. In the U. S. it is now common from Cal. to Utah and Tex. and s. through Mex.; it also occurs in n. S. Am.

DESCRIPTION: Stems usually decumbent at base, 8 to 32 in. high; sometimes with long creeping and rooting stolons. Leaves numerous, light green, the blades short and narrowed from below the middle to the abruptly pointed apex. Panicle contracted, lobed or whorled, especially at the base, 1 1-2 to 4 in. long, light green or rarely purplish, the branches spikelet-bearing from the base. Glumes equal in length, blunt, roughish on the back and keel; lemma 1-2 as long as the glumes, awnless, toothed at the apex; palea nearly as long as the lemma. Resembles greatly *Polypogon littoralis* in habit, but the latter has awned glumes.

HABITAT: Moist ground, especially along irrigation ditches at lower elevations. In Cal. it is especially common in the irrigated regions of the southern part of the state.

FLOWERING PERIOD: More data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: It is doubtful if this species occurs to any considerable extent on ranges within National Forests. Notes as to its forage value are not available.

Agrostis thurberiana Hitchc.

Thurber's redtop

RANGE: From Brit. Col. and Mont. to Cal. and Utah.

DESCRIPTION: A small slender tufted grass, 4 to 16 in. high; leaves soft, flat, a very light green in color. Panicle narrow and somewhat spike-like or somewhat loose and drooping, 2 to 3 in. long. Spikelets green or rarely purple. Lemma nearly as long as the glumes; palea about 2-3 as long as the lemma; axis of the spikelet prolonged behind the palea as a minutely hairy rudiment. This last-mentioned characteristic sets this species, together with *A. aequivalvis*, apart from other species of the genus and some authorities have erected these two species into a separate genus, *Podagrostis*, intermediate between *Agrostis* and *Calamagrostis*. This species is sometimes confused with *A. aequivalvis*, from which, however, it is distinguishable by its wider, more numerous and laxer leaves, its usually narrower and less spreading panicle, and the shorter palea and spikelet-pedicel.

HABITAT: Moist to wet sites in the mts.

FLOWERING PERIOD: More data needed.

SEED DISSEMINATION: More data needed

FORAGE VALUE: Highly palatable to all classes of stock; the numerous soft basal leaves produce an abundance of forage and remain green practically throughout the season.

Agrostis verticillata Vill. See *A. stolonifera* Linn.

Agrostis vulgaris Withering. See *A. alba vulgaris* (With.) Thurber.

AIRA

A small genus of the *Aveneae* or Oat tribe, numbering 5 or 6 species in Europe and n. Africa; the 2 species occurring in the U. S. have both been introduced.

Delicate annual grasses with narrow leaves and open panicles of small, 2-flowered spikelets. The rachilla or axis of the spikelet is articulated just below the 1st or lower lemma, so that the glumes persist when the rest of the spikelet drops off. These glumes are thin, dry, membranaceous, pale-colored, nearly equal in length, sharp-pointed but unbearded and longer than the lemmas. The lemmas are transparent and usually 2-toothed at the apex, awned on the back, the awn twisted below and bent. Just opposite each of the lemmas is the transparent, 2-nerved scale, almost as large, called the "palea"; in fruiting the grain usually adheres closely to this and the lemma.

Aira caryophyllea Linn.

Silvery hair-grass

RANGE: A native of Europe, introduced locally in the United States. In the East it occurs from e. Mass. and Nantucket Island s. to Ohio and Va. On the Pacific coast it is found from Vancouver Island to s. Cal.

DESCRIPTION: Smooth throughout; stalks solitary or few, slender, erect, 4 to 12 in. high. Leaf-blades bristle-like, 1-12 to 1 in. long. Panicle open, the silvery, shining spikelets clustered toward the ends of the spreading thread-like branches. Spikelets about 1-8 of an in. long and nearly as broad; lemmas 2-3 as long as spikelets, awned below the middle with awns about 1-6 of an in. long.

HABITAT: In fields, waste places and other open ground.

FLOWERING PERIOD: May to July.

SEED DISSEMINATION: June to Aug.

FORAGE VALUE: Negligible.

Aira latifolia Hook. See *Deschampsia atropurpurea latifolia* (Hook.) Scribn.

ALOPECURUS

Annual or perennial grasses, never prostrate or decumbent, with flat leaves and densely-flowered spike-like or head-like panicles, which are soft to the touch; members of the *Agrostideae* or tribe to which cultivated Timothy and Redtop belong. There are about 20 species known, confined to temperate climates of all continents, except perhaps, Africa. Not very well represented in North America, which has 5 or 6 species.

The spikelets are 1-flowered, strongly flattened. An unusual thing in this tribe and, in fact, in this series of grasses is the fact that the spikelets fall off entire, the rachilla or axis of the spikelets being articulated below the glumes. These glumes are about equal in length, without awns, united at the base, and more or less fringed with hairs, especially along the keel or midrib. The lemma is transparent, blunt-pointed, about as long as the glumes, the margins growing together near the base forming a short tube, and, from below the middle of the back, a slender, erect awn is produced.

The name is a Latinized derivative from the Greek words *alopex* (fox) and *oura* (tail) alluding to the shape of the spikes.

***Alopecurus aristulatus* Michx.**

Short-awned foxtail

A. fulvus J. E. Smith and*A. geniculatus fulvus* (J. E. Smith) Sonder, for American plants.

RANGE: Widely distributed in N. Am.; it has probably been collected in very nearly every State of the Union and also in Alaska. It has been submitted for identification from all Forest Service districts. It apparently is absent from Mex. This species has been held by some to be identical with a variety of the Water foxtail found in Europe and Asia, but the best authorities now consider the American plant distinct.

DESCRIPTION: A perennial, growing in dense clumps, with an elaborate fibrous root system; stems dark brown at the joints, bent just above the ground and then erect or spreading, 4 to 24 in. high. Leaves numerous, narrow, flat, rough above, 1 to 6 in. long. Spike rather narrow-cylindrical, about 1 1-2 to 3 1-2 in. long. Awn inserted a little below the middle of the lemma and scarcely or not at all protruded. This species is variable in size of the spikelets, size of awn and the degree of bending at the base of the stalks. Western forms are especially distinct and appear to be unquestionably native; they have shorter awns and are less bent at the base.

HABITAT: Common in wet places, especially on sandy shores of lakes and rivers, and around springs, extending to the higher elevations in the mts. Found between 4,000 and 11,500 ft. in Colo. Collected on the Payette N. F. at 5,200 ft., at 6,300 ft. on the Deerlodge N. F., and, at 7,100 ft., on the Tusayan N. F. It usually has a scattering stand, growing in gravelly soils along streams and in among open willows; it grows also in water.

FLOWERING PERIOD: June to Aug; given as July to Aug. on the Deerlodge N. F., and, as middle of June to July, on the Payette N. F.

SEED DISSEMINATION: Late July to Oct.; given as Aug. 15 to Sept. on the Deerlodge N. F., and, as about Aug. on the Payette N. F.

FORAGE VALUE: Reported from the Deerlodge N. F. to be "palatable to horses, cattle and sheep, but so sparingly distributed as to be of almost negligible importance." "Excellent for cattle and horses (at least on the Payette N. F.) but it does not form an important part of the forage."

***Alopecurus californicus* Vasey**

California foxtail

RANGE: Brit. Col. to w. Mont. and s. to Cal.; also in the mts. of Ariz. Mostly in the Coast Ranges in Cal.

DESCRIPTION: A perennial, 4 to 24 in. high. Leaf-sheaths conspicuously inflated. Spike oblong, relatively wide, about 3-4 to 2 in. long. Spikelets about 1-8 in. long, noticeably longer than those of *A. aristulatus* and *A. geniculatus*; awns about 1-5 in. long, bent or twisted and protruded conspicuously; anthers orange-color, not white as is the case in some species of this genus. Resembles somewhat the cultivated Meadow foxtail (*A. pratensis*) but has a much smaller spike, smaller spikelets and shorter awns. It differs from *A. geniculatus* in its thicker spike, longer spikelets and longer awns.

HABITAT: Meadows and wet places.

FLOWERING PERIOD: The flower stalks appear to be sent up early, but more data are needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: Reported to be "fair" forage on the Modoc N. F. Further notes are needed.

Alopecurus fulvus J. E. Smith. Synonymous, in North America, with *A. aristulatus* Michx.

Alopecurus geniculatus Linn.

Water foxtail

RANGE: In the cooler portions of the northern hemisphere. Very widely distributed in N. Am., occurring in Alaska, Nfd., Lab. and almost throughout Can. and has been collected in practically every State of the U. S., although it is rare in Cal. and perhaps does not occur in Fla.

DESCRIPTION: Rather low, smooth or nearly so, with a tendency toward a sprawling habit; stems slender, 6 to 24 in. high, though usually under 12 in., with a knee-like bend at the base, where they often take root and sprout. Leaf-blades flat, rather numerous; leaf-sheaths usually shorter than the internodes, slightly roughish, especially the upper ones, loose as if inflated. Spike slender, cylindrical, 1 to 3 in. long; spikelets very short, about 1-12 of an in. long; lemma shorter than the blunt glumes, provided with a bent awn protruded about 1-12 in. Differs from *A. aristulatus* in being decumbent at base and having a longer and exserted awn.

HABITAT: In water and wet places; common along banks of streams, low wet meadows and shallow water fringing lakes and ponds. Collected at 5,100 ft. on the Lewis & Clark N. F. and, at 6,750 ft., on the Tusayan N. F.

FLOWERING PERIOD: June to Aug.

SEED DISSEMINATION: Late July to Oct.

FORAGE VALUE: An excellent forage plant for cattle and horses, being tender and nutritious with abundant leafage remaining green throughout the season.

Alopecurus geniculatus fulvus (J. E. Smith) Sonder. See *A. aristulatus* Michx.

Alopecurus occidentalis Scribn.

Mountain foxtail

RANGE: W. Brit. Col. and Alb. s. to Utah and Colo.

DESCRIPTION: Erect, rather slender, 2 to 3 ft. high, or, in exceptionally favorable habitats, forming a luxuriant growth at least 4 ft. high. Leaves flat, 2 to 6 in. long; sheaths loose. Spike oblong, rather thick, 3-8 to 1-2 in. through, and short, from 0.8 to 1.6 in. long. Spikelets long, 1-6 to 1-5 in.; lemma a little shorter than the glumes, with a relatively long, straight awn, inserted below the middle, nearly 1-4 in. long. It looks something like alpine timothy, but is usually more robust and of a softer texture and produces a much better looking hay. It is distinguishable from *A. aristulatus* most easily by its thicker spike and longer awns. Known also as Western or Alpine foxtail.

HABITAT: Common in wet meadows in the high mts.; according to Rydberg it is found between 5,000 and 8,300 ft. in Mont. and between 8,500 and 11,000 ft. in Colo.

FLOWERING PERIOD: More data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: Very palatable to cattle and horses. It bears an especially high reputation as a hay plant, yielding a large bulk of fine, long, bright-colored hay which is held in great esteem wherever it occurs. It is beyond a doubt one of the most promising of all our native grasses for cultivation in high mt. meadows.

AMMOPHILA

A genus composed of only a single species. It belongs to the *Agrostideae* or Redtop-Timothy tribe and is very closely related to *Calamagrostis* from which genus it differs mainly in its larger spikelets, thicker lemmas and unique habitat and aspect. The name is a derivative from the Greek *ammos* (sand) and *philos* (loving).

***Ammophila arenaria* (L.) Link**

Beach-grass

RANGE: Seacoast of Europe and the British Isles, the Atlantic coast of N. Am. as far s. as N. C., and along the shores of the Great Lakes. Introduced on the Pacific coast in 1876 for the purpose of binding the drifting beach sands of Golden Gate Park, San Francisco; since then it has spread rapidly along the western coast of N. Am.

DESCRIPTION: A coarse perennial, of a whitish or pale-green appearance, with tall, erect, rigid, solid stalks, 2 to 4 ft. high. "Its long (scaly) creeping root-stocks, extending sometimes to the extent of 40 ft. and bearing tubers the size of a pea, interlaced with death-like tenacity of grasp, form a network beneath the sand which resist the most vehement assault of the ocean." Leaf-blades elongated, usually flat below and gradually narrowed above into a spirally inrolled point. Inflorescence in the form of a dense, narrow, elongated, spike-like panicle, 4 to 12 in. long. Spikelets approximately 1-2 in. long, 1-flowered, the rachilla or spikelet-axis prolonged behind the palea as a small hairy rudiment, as in the very closely related genus *Calamagrostis*. Glumes somewhat hairy, nearly equal in length, sharp-pointed and of firm texture; lemma papery, with a ring of short hairs at the base, subtending a papery 2-nerved palea. Lower glume, 1-nerved; upper glume, 3-nerved; lemma, 5-nerved. Grain free, loosely enveloped in the lemma and palea. Also known as Marram-grass and Sand-grass.

HABITAT: Sandy shores of oceans and lakes.

FLOWERING PERIOD: June and July.

SEED DISSEMINATION: Aug. and Sept.

FORAGE VALUE: Although not commonly regarded as a forage plant, it is reported from the Siuslaw and Umpqua National Forests to be very palatable to stock when it first comes up in the spring. On the New England coast it is often cut for bedding, and is said to have importance for making certain kinds of coarse paper. The chief value of the plant, however, is in its unequalled usefulness as a sand-binder on the coasts, and its service as such can hardly be overestimated. Perhaps the most striking illustration of its usefulness on this continent is to be found in the town of Provincetown, Mass., at the tip of Cape Cod, whose harbor is one of the largest and deepest on the eastern coast of the U. S.; the existence of both Provincetown and its harbor is due to the presence of this grass on its beaches. No matter how vigorous the action of waves or wind this grass will always keep its head above the surface, and underground stems of beach-grass have been traced in sand dunes for over a hundred feet.

***Amphilophis torreyanus* (Steud.) Nash.** See *Andropogon laguroides* Lag.

ANDROPOGON

Coarse, rigid, perennial grasses, with solid stems and usually long and narrow leaves, growing chiefly in dry, sandy or sterile soils. The type genus of the *Andropogoneae* or Beard-grass tribe of the Grass family, to which sugar-cane and sorghum also belong. Inflorescence in racemes, terminal or from the axils of the leaves, arranged in pairs or finger-like in 5's or less, or, in the subgenus *Amphilophis*, numerous, forming a kind of panicle. Spikelets arranged in pairs at each joint of the conspicuously hairy rachis or raceme-axis, one stemless and "perfect," with both male and female flowers, the other spikelet on a hairy pedicel or stalk, containing male flowers only, or empty, or reduced to a single scale, or rarely entirely wanting. The perfect stemless spikelet consists of 2 glumes, the lower flattened on the back and somewhat leathery in texture, the upper glume keeled and sharp-pointed, and 2 thin translucent lemmas, the upper one awned

and subtending the floral organs or else the palea; the palea is either minute or wanting. Stamens, 1 to 3. Grain, free.

There are approximately 200 species of *Andropogon* known, it being one of the largest of grass genera; members of it are found in both hemispheres, especially in the tropics and sub-tropics. About 40 species occur in the U. S., best represented in the southeastern States, Florida, with 21 species, being about the center of distribution.

The name *Andropogon* refers to the characteristic beard-like hairs of the inflorescence (Greek *andros*, man's, and *pogon*, beard).

***Andropogon chrysocomus* Nash**

Yellow-haired beard-grass

RANGE: Nebr. to Colo., N. Mex. and Tex.

DESCRIPTION: 2 to 6 ft. tall, the branches in 1's to 3's; often has a bluish aspect. Blades 1 ft. long or less, a little roughened above; sheaths often hairy. Racemes in 2's to 4's, 2 to 3 1-2 in. long; glumes hairless except on the margins and sometimes on the nerves; awns about 1-2 in. long, bent and twisted at the base. The beard-like hairs on the internodes of the rachis and on the pedicels of the perfect spikelets are from 1-8 to 1-6 in. long and of a yellow or golden hue, to which the scientific name, a Latinized adjective from the Greek *chrusos*, gold, and *kome*, hair, alludes.

HABITAT: On plains, sandy soils along creeks, dry hillsides and open places; between 4,000 and 8,000 ft. in Colo. (fid. Rydberg); from 6,000 to 7,500 ft. in N. Mex. (fid. Wooton & Standley).

FLOWERING PERIOD: June to Aug.

SEED DISSEMINATION: July to Oct.

FORAGE VALUE: Reported from the Jemez N. F. to be "eaten readily by all stock." Its distribution on the range, however, is usually rather sparse.

***Andropogon contortus* L. See *Heteropogon contortus* (L.) Beauv.**

***Andropogon furcatus* Muhl.**

Big bluejoint

RANGE: From Me. to Sask. and s. to Fla. and Tex. and practically throughout Mex.; also along the coast of Provence, France.

DESCRIPTION: One of the taller *Andropogons*, usually growing in large tufts, though sometimes provided with creeping rootstocks. Stalks smooth, stout, erect, blue-jointed, branching from the upper joints. Leaves tapering-pointed, 6 to 18 in. long, the sheaths and lower part of the blades hairy. Spike-like racemes 10 to 20-flowered, 2 to 6 in number, in pairs or close together, about 2 to 4 in. long, frequently having a clawed appearance. Glumes somewhat rough to the touch and hairy, the lower one 1-4 to 1-3 in. long; awns loosely spiral, bent, 2-5 to 3-5 in. long. Also known as Turkey-foot, Big bluestem, Tall beard-grass and Broom-grass.

HABITAT: Usually in dry, sandy or rocky soils, in dry meadows or in sandy pine barrens of the Southeast; common on hillsides; between 4,000 and 8,000 ft. in Colo.

FLOWERING PERIOD: June and July.

SEED DISSEMINATION: Aug. and Sept.

FORAGE VALUE: In parts of the West this species is highly valued for hay, but it must be cut in early bloom or stock will reject it, since it becomes hard and fibrous. The long leaves are sent up early in the season, at which time it is a very valuable forage plant, and, in some localities, is one of the most important constituents of the range forage.

***Andropogon halepensis* (L.) Brot. See *Holcus halepensis* L.**

***Andropogon hallii* Hack.**

Turkey-foot

RANGE: In the sandhill district of Nebr., Kans. and Okla. and along the eastern border of the Rocky Mts. from Mont. to N. Mex. Also collected on the Coconino N. F.

DESCRIPTION: A very coarse, yellowish-green grass, 3 to 6 ft. tall, from a creeping rootstock. Stalks simple at base, branched above, smooth, somewhat whitish in appearance. Leaves smooth, 1 ft. long or less, the blades wide below; sheaths somewhat swollen. Spike-like racemes, 1 to several, the lateral ones often partly hidden in the upper sheath; inflorescence has a very characteristic feathery appearance from the abundance of white, silky hairs on the rachis and pedicels. Spikelets unawned or else with very short, straight awns. Known also as Hall's beard-grass, Big feather-grass, Big bluestem, etc.

HABITAT: Dry sandy soils of plains and foothills, where it is frequently the most conspicuous feature of the vegetation. Occurs in bunches and small colonies over cindery clay areas in the n. e. portion of the Coconino N. F. and, occasionally, in the upper woodland type, between about 6,000 and 6,700 ft.

FLOWERING PERIOD: July and Aug.

SEED DISSEMINATION: Aug. and Sept.

FORAGE VALUE: Eaten ordinarily on the range to a slight extent by cattle and horses, but the palatability of the leaves remains about the same the year round. It makes good hay and is often cut for that purpose.

***Andropogon laguroides* Lagasca**

Hare's-tail beard-grass

Amphilophis torreyanus (Steud.) Nash

Andropogon torreyanus Steudel

Andropogon saccharoides of American writers, but not *A. saccharoides* Swartz.

RANGE: Mo., Nebr., Kans., Colo., Utah, Nev., Ariz., N. Mex. and Tex.; practically throughout Mex. and in the Cordilleras of Chile and Argentina.

DESCRIPTION: A coarse, tufted, fibrous-rooted grass, 1 1/2 to 4 ft. high, often silky-haired at the joints, the juice rather sweet. Leaves flat, 4 to 12 in. long. Spike-like racemes numerous, arranged in a somewhat fan-shaped cluster; inflorescence has a feathery appearance from the abundant white silky hairs. Awns spiral, bent, 1-3 to 2-3 in. long. By some authorities this species with its nearest allies has been erected into a separate genus called *Amphilophis*, although most authors deem it worthy of only subgeneric rank. *Amphilophis* differs from typical *Andropogon* in the following particulars: (1) *Amphilophis* has usually numerous racemes, forming a kind of panicle, while in typical *Andropogon* the racemes are arranged in pairs or finger-like in 5's or less; (2) *Amphilophis* has the axis of the inflorescence as well as the pedicels of the spikelets grooved, with thickened margins and a thin translucent line in the middle; these characters are wholly absent in typical *Andropogon*; (3) the lemma of *Amphilophis* is pedicel-like, tapering into the awn; the lemma of typical *Andropogon* is scale-like. This species is known also as Torrey's beard-grass, Big feather-grass, Feather bluestem, Sugar beard-grass, etc. The scientific specific name *laguroides* refers to the resemblance of this plant to the closely related Old World genus, *Lagurus*, or Hare's-tail grasses.

HABITAT: Ditch-banks, arroyos, roadsides, rocky situations along beds of draws, and other dry or medium dry soils. On the Coconino N. F. it is found in the lower Y. P. and upper woodland types, between about 5,500 and 6,800 ft.; it also occurs in the cindery soil in the n. e. portion of the Forest where practically no other grasses grow.

FLOWERING PERIOD: July to Sept.; Aug. and Sept., Coconino N. F.

SEED DISSEMINATION: Aug. to Oct.; Sept. and Oct., Coconino N. F.

FORAGE VALUE: Reported from the Coconino N. F.: "While very palatable and succulent when young the mature grass is rather coarse to be eaten closely except where other forage is scarce." The plant is remarkably drought-resistant and experiments seem to indicate that, in parts of the arid Southwest, it may become of considerable value because of this feature. Varieties of this species are sometimes cultivated for ornamental purposes.

Andropogon nutans avenaceus (Michx.) Hack. See *Sorghastrum nutans* (L.) Nash.

Andropogon saccharoides Swartz. This grass is a native of Jamaica and some of the other West Indian islands; it does not occur in continental North America. For the "*Andropogon saccharoides*" of the books and Forest Service material previously identified under that name see *A. laguroides* Lag.

Andropogon scoparius Michx. Small feather-grass
Schizachyrium scoparium (Michx.) Nash

RANGE: Widely distributed, from N. B. to Alb. and, in the U. S., it probably occurs in every State e. of the three Pacific coast States, although there appears to be no record of it in Mex. It is one of the most common grasses in the basins of the Bad Lands and in the Black Hills of S. Dak. In the Great Plains it is usually associated with Big bluejoint (*Andropogon furcatus*) and Indian grass (*Sorghastrum nutans*).

DESCRIPTION: Relatively slender, 1 to 4 1-2 ft. tall; stems yellow to reddish brown or purplish, often branched above; fine, fibrous roots. Leaves slender, usually 4 to 8 in. long., occasionally as long as 18 in. Inflorescence in the form of solitary racemes, terminal both from the main stalk and its branches also, loose, 1 to 2 1-2 in. long, borne on long-protruded peduncles; rachis hairs abundant but short. Awns twisted, about 1-2 in. long. Specimens from the sandhills of w. Nebr. and Kans. and e. Colo. are always tufted, with flat leaf-sheaths covered with a sort of white down and with the joints of the spikes usually hairy. The scientific name *scoparius* is Latin for "broom," and this species is often called Broom beard-grass and Broom sedge; also known as Little bluestem to distinguish it from Big bluejoint (*A. furcatus*) with which it is frequently associated.

HABITAT: Dry sandy soils and the like. Wootton and Standley report that it is "fairly common in the mts. on drier slopes in pine timber or in gullies and along dry water courses in the higher plains, especially in the n. and e. of N. Mex." Reported from the Coconino N. F. as occurring in "dry cindery-clay in n. e. part, in Y. P. type; also in rocky situations scattered over entire Y. P. forest and upper woodland type."

FLOWERING PERIOD: July to Sept.; July and Aug., Coconino N. F.

SEED DISSEMINATION: Aug. to Oct.; Aug. and Sept., Coconino N. F.

FORAGE VALUE: In many places this plant is regarded as a pest. However, in the dry pine woods of the southeastern States "it contributes, when green and tender, a large share to the sustenance of stock." In the West it is sometimes cut for hay. In the sandhill region of w. Nebr. and Kans. it is usually regarded as worthless; nevertheless it is a common constituent of prairie hay and makes good fodder if cut early. On the elevated plateaus of northern and eastern Ariz. it is held in good repute as forage "when the dry stems do not interfere."

Andropogon torreyanus Steud. See *A. laguroides* Lag.

ANTHOXANTHUM

A member of the *Phalarideae* or Canary-grass tribe, one of the smallest main divisions of the Grass family. A small genus, of 4 or 5 species, all natives of Europe and occurring in the U. S. only as introduced species. Fragrant annuals or perennials, with flat leaves, narrow, spike-like, yellowish panicles, and narrow, somewhat compressed, perfect, 1-flowered spikelets. Glumes very unequal in size, the 1st shorter than the 2d, both, however, much longer than the 3 lemmas. Lowest 2 lemmas sterile, clothed with brown hairs, awned on the back, larger than the slightly thickened fertile lemma above them to which they are attached and with which they fall away. Stamens, 2. Grain, free. The scientific name is derived from the Greek *anthos* (flower) and *xanthos* (yellow) alluding to the yellowish spikelets.

Anthoxanthum odoratum Linn.

Sweet vernal-grass

RANGE: Widely naturalized in the U. S. and Canada, where it is often common, especially in the East and in the cooler and moister regions. Occasionally cultivated.

DESCRIPTION: Perennial, 8 in. to 2 ft. high, with rather short leaves, roughish above. Spike-like panicle pointed, 1.2 to 3.2 in. long. Spikelets a dark yellow or brownish green; glumes somewhat hairy; sterile lemmas short-awned. Especially fragrant when drying.

HABITAT: Meadows, pastures and the moister waste-places.

FLOWERING PERIOD: April to July.

SEED DISSEMINATION: June to Aug.

FORAGE VALUE: "It is an inferior fodder grass, but owing to its earliness it possesses some value in mixtures for pastures, and its sweet scent adds a pleasing fragrance to hay, of which it should form only a small percentage. The leaves have a bitter taste, and the grass is apparently unpalatable to stock, for they will not readily eat it. It is regarded as a serious pest in New Zealand. The stems have been used in the manufacture of imitation Leghorn hats."

ARISTIDA

A large genus, of over 100 species, belonging to the *Agrostideae* or Redtop-Timothy tribe of the Grass family; they grow chiefly in dry, sandy or sterile soils and are especially well represented in the warmer regions of both hemispheres. About 40 species occur in the U. S., mostly in the southern portion, Texas, with approximately 30 species, being the center of distribution.

The members of this genus vary greatly in habit and inflorescence; they are tufted grasses, with narrow, often inrolled and even bristle-like leaves. The spikelets are narrow and 1-flowered, the glumes narrow and keeled, the lemma firmer than the glumes, hardened at maturity, narrow, rigid, the edges rolled together, bearing at its terminus three awns which are occasionally united at the base, the lateral awns sometimes reduced to rudiments or, rarely, wanting. The palea is thin, 2-nerved, completely inclosed by the lemma. The grain is free but is tightly inclosed by the lemma and palea. The scientific name refers to the peculiar awn which is the most characteristic feature of the genus.

Aristida arizonica Vasey

Arizona three-awn

RANGE: Known originally from Ariz.; also occurs in N. Mex., w. Tex. and n. Mex.

DESCRIPTION: A perennial bunchgrass, "one of the largest of the 'needle-grasses'"; stems stout, erect, 1 to 2 1-2 ft. high. Leaf-blades 5 to 12 in. long,

at first flat, later becoming spirally inrolled and, on drying, curling up close to the ground. Panicle narrow, often stained with purple, 5 to 10 in. long, erect or weakly spreading, with erect branches about 2 in. long, mostly single or in twos, each with from 2 to 5 spikelets; there are frequently some flower-bearing branchlets near the base of the plant. Spikelets 3-8 to 1-2 in. long, on short, straight pedicels. Glumes noticeably short-awned, the lower 3-nerved, the upper 1-nerved and a little longer than the lower glume. Lemma twisted spirally just below the "triple awn"; these three awns are united at the base, the free ends 0.8 to 1.2 in. long. This species and *A. purpurea* are reported to be the most common *Aristidas* in N. Mex. Known also as Curly three-awn and Tall three-awn.

HABITAT: An upland rather than a valley plant. On sandy-gravelly plains or, more commonly, in scattered bunches over mesas and foothills or among rocks in the mts. between about 6,000 and 9,000 ft.

FLOWERING PERIOD: July and Aug.

SEED DISSEMINATION: Aug. and Sept.

FORAGE VALUE: Reported by Mr. H. L. Bentley (Div. Agros. Bull. 10, p. 29) to have "economic value both as a hay and pasture grass" in w. Tex. Prof. J. J. Thornber (Univ. Ariz. Agr. Expt. Sta. Bull. 65, p. 282) says of this species: "Seldom abundant enough to become a principal element in the plant covering and grazed mostly in the summer and fall * * * they die to the ground in the winter, for which reason they are not valuable for winter grazing. Their sharp-pointed seeds are troublesome to sheep and goats, causing inflammation and sores in the mouth." This species is reported from the Tusayan N. F. to be "valueless as forage. No class of stock likes it."

***Aristida bromoides* H. B. K.**

Brome three-awn

RANGE: From s. Cal., through Ariz. and N. Mex. to extreme w. Tex. and s. through Mex. The type specimen of the species, however, appears to have been collected in high mountains not far from Quito, Ecuador, early in the 19th century.

DESCRIPTION: An annual. Stems slender, often purplish, 4 to 18 in. high, commonly much branched from the base, erect or often spreading or even prostrate, forming close tufts. Basal leaves few and very short; stem leaves 2 or 3, and 1 to 3 in. long, often inrolled and bristle-like. Spikelets green or purplish in color; in a narrow, rather dense, erect, spike-like panicle, 1 to 3 1-2 in. long, the branches erect and flowering nearly to their bases. Lower glume considerably shorter than the 1-nerved upper glume. Awns finally spreading, about equal in length, approximately 5-12 in., or the lateral ones sometimes shorter. Specific name refers to superficial resemblance of this plant to some of the weedy, annual bromes. Known also as Needle-grass and Annual three-awn.

HABITAT: Open grounds; "a common 'six-weeks grass' on the mesas and to some extent in fields after the summer rains", when it often covers large areas. Collected at 4,500 ft. on the Coronado N. F.; in sandy clay at 6,500 ft. on the Gila N. F.; on a mesa at 5,500 ft. on the Apache N. F., and in a wash at 2,250 ft. near the Inyo N. F.

FLOWERING PERIOD: Mainly Aug.

SEED DISSEMINATION: Mainly Sept.

FORAGE VALUE: Not known to have any. Wooton & Standley report: "Its presence indicates that better grasses have been eaten out."

***Aristida dispersa* Trin. & Rupr.** See *A. divaricata* Humb. & Bonpl.

***Aristida divaricata* Humb. & Bonpl.**

Texas poverty-grass

A. dispersa Trin. & Rupr.

A. divergens Vasey

RANGE: From s. Cal. through Ariz. and N. Mex. to w. Tex. and s. to Lower Cal. and, on the Mexican plateau, to Centr. Am. Reported also from Kans.

DESCRIPTION: A perennial bunchgrass, the tufted, erect stems 1 to 3 ft. high. Leaf-blades spirally inrolled, about 6 in. long; leaf-sheaths overlapping. Panicle very open, often more than half the length of the entire plant, the branches distant, widely and horizontally spreading, commonly in pairs, and spikelet-bearing towards the ends only. Glumes nearly equal in length, about 1-2 in. long, 1-nerved, short-awned, the 1st or lower glume rough on the keel. Lemma about 5-12 in. long, rough at the scarcely narrowed apex, but not twisted; awns 1-2 to 5-6 in. long, somewhat spreading, all about the same length. Also known as Spreading three-awn. The specific name refers to the divaricate, i. e., widely spreading, branches of the panicle.

HABITAT: In dry, sandy soils, growing scatteringly over mesas, foothills and in the mts. up to about 7,000 ft. in the Southwest. In N. Mex. it is more common in the southern part of the State, especially on sandhills and mesas.

FLOWERING PERIOD: July and Aug.

SEED DISSEMINATION: Aug. and Sept.

FORAGE VALUE: "Grazed mostly in summer and fall seasons" (Prof. J. J. Thornber). Additional notes on the forage value of this species are desired.

***Aristida divergens* Vasey.** See *A. divaricata* Humb. & Bonpl.

***Aristida fasciculata* Torr.**

Dog-town three-awn

RANGE: From Minn. to Idaho and southw. through Tex. and Ariz. into Mex. Reported also from Brit. Col. and Cal.; its occurrence in these two localities, however, seems open to question.

DESCRIPTION: A densely tufted grass, with usually slender, erect, reddish or purplish stalks, 8 to 16 in. high; appears to occur both as an annual and a perennial. Roots, usually few and short. Leaves numerous, short, slender, rather rigid, spirally inrolled. Inflorescence in a contracted panicle, 2 to 5 in. long, the generally purplish spikelets somewhat crowded on the short branches, which are spikelet-bearing approximately to the base. Glumes very unequal, the 1st or lower glume about 1-2 as long as the 2d or upper glume, the latter 1 in. long or less. Lemma usually about 1-2 in. long. Awns spreading, the three about equal in length, usually 1-2 to 1 in. long, although lengths as great as 4 in. have been reported. Known also as Dog-town grass, Dog-town needle-grass, Triple-awned beard-grass and Annual red three-awn.

HABITAT: Common, especially in dry sandy or gravelly soils on prairies, mesas and foothills. Reported from the Coconino N. F. as being quite common between 5,000 and 6,500 ft., occurring usually in clay loam soils in the woodland type in mixtures with a scattered stand of side-oats grama and rabbit-brush.

FLOWERING PERIOD: Mar. to Aug., depending on locality. Given as from about Aug. 15 to Sept. 15 on the Coconino N. F.

SEED DISSEMINATION: Apr. to Sept., depending on locality. Given as Sept. on the Coconino N. F. Nash gives this period for the middle West as Aug. and Sept.

FORAGE VALUE: Reported from the Coconino N. F. as "practically of no value for grazing except when young and tender." T. A. Williams says of this plant in the Dakotas (see Div. Agros. Bull. 6, p. 28) "while young it is eaten by stock, but the stems soon become so tough and wiry as to be unpalatable even in hay, and the grass is very difficult to cut with a mower. It has little value agriculturally." Prof. L. H. Pammel, in Div. Agros. Bull. 9, p. 34, states regarding

this species: "W. of Lincoln (Nebr.) it becomes very common. Though not considered of much value on the plains, it is not without merit in the foothills."

A very interesting account of this grass as a range plant in centr. Tex. is given by H. L. Bentley in Div. Agros. Bull. 10, pp. 23 and 24, where it is held to be "one of the most valuable, all things considered, of the pasture grasses found in this section." Its value is shown to be due to its abundance, admirable powers of reproduction, the extremely early date at which it becomes green in the spring, its nutritiousness, its palatability late in the season and its curing on the ground, and the quickness with which it "greens out" after a warm rain succeeding a period of drought.

***Aristida fendleriana* Steud.**

Small three-awn

RANGE: Mont. and S. Dak. to Tex. and Cal. Also in Lower Cal. and as far southw. as centr. Mex.

DESCRIPTION: A small perennial, 4 to 12 in. high. Leaves about 2 in. long, narrow and fine, forming a curly turf around the base of the flower stalks. Spikelets few and scattered, about 3-5 in. long, arranged in a narrow, but open panicle, 2 to 4 in. long, mostly short-pedicel. Glumes of unequal length; lemma 1-3 in. long, midway between the glumes in length; awns about equal in length, ascending about 1 to 2 in. long. Also known as Fendler's triple-awn grass.

HABITAT: Mostly in sandy soils, on deserts, plains, mesas or in parks in the mts. up to about 8,500 ft. Wooton & Standley state its occurrence as "5,500 to 7,000 ft. in middle and n. N. Mex., in mesas and foothills."

FLOWERING PERIOD: June and July.

SEED DISSEMINATION: July and Aug.

FORAGE VALUE: This species is listed in Univ. Ariz. Agr. Expt. Sta. Bull 65 as one of a number of grasses supplying spring and early summer forage on the higher mesas and foothills of Ariz. Later in the summer the awns make it a menace to stock. It was noted to be only very slightly grazed on the Coconino N. F. in late summer. Reported from the Tusayan N. F. as "practically valueless as forage. No class of stock likes it." Stated to be "good forage while green, but only fair after frost" on the Apache N. F.

***Aristida havardii* Vasey**

Havard's three-awn

RANGE: W. Tex. through N. Mex. to Ariz.

DESCRIPTION: A low, rather spreading, tufted perennial, 6 to 12 in. high, with slender, branching, wiry stems. Leaf-blades narrow, spirally inrolled, frequently bristle-like. Panicle broad and open, the branches widely spreading and somewhat flexuous. Spikelets on slender but stiff pedicels. Glumes sharp, tapering-pointed but not awned, slightly unequal in length. Awns spreading nearly equal, about 3-8 to 3-4 in. long. Known also as Havard's poverty-grass.

HABITAT: Scattering over mesas and foothills and, more sparingly, in the mts. up to about 7,000 ft. More abundant in the southern than in the northern portions of Ariz. and N. Mex.

FLOWERING PERIOD: July to Sept.

SEED DISSEMINATION: Aug. to Oct.

FORAGE VALUE: Worthless for winter grazing, as it dies to the ground, but fair feed for cattle and horses in the summer and fall. Its lack of palatability and abundance preclude its consideration as an important forage plant. The awns are apt to be troublesome, especially to sheep.

Aristida longiseta Steud.

Long-awned needle-grass

RANGE: Rather widely distributed in the region w. of the Mississippi River, especially southw., but the range data are still apparently very incomplete. Known to occur from S. Dak., Nebr. and Kans. to Mont. and southw. through the Rocky Mt. region to Ariz., N. Mex. and Tex.; also in the State of Chihuahua, Mex. It has also been collected in n. e. Oreg., at a relatively low elevation near the Snake River, on the Wallowa N. F., where, however, it is reported to be "not abundant." Reported also from Ill. and Wash.

DESCRIPTION: A densely tufted perennial with smooth, erect, slender stalks, 4 to 16 in. high. Leaves numerous, mainly basal, somewhat wiry, curling, inrolled, 1 to 4 in. long. Panicle 4 to 8 in. long, usually somewhat purplish, the branches ascending and with but a solitary spikelet or, in the case of the longer branches, sometimes with 2 spikelets. Spikelets about 1 in. long; 1st or lower glume 1-2 as long as the 2d or upper glume; lemma 1-2 to 2-3 in. long, about 2-3 as long as the upper glume. Awns ascending, often purplish, the central one 2 1-2 to 4 1-2 in. long, the laterals as long or shorter. Known also as Prairie three-awn and Long three-awn. "The most easily recognized species of the genus."

HABITAT: Dry sandy soils on plains and mesas, almost wholly below the Y. P. zone. It occurs in Colo. (fid. Rydberg) between 4,000 and 8,500 ft.

FLOWERING PERIOD: June and July.

SEED DISSEMINATION: Middle of July to Sept.

FORAGE VALUE: A hardy and resistant species of little or no forage value; very early in the spring it may be limitedly grazed.

Aristida oligantha Michx.

Prairie three-awn

RANGE: A native of the southeastern States, now widely distributed over the U. S. Probably introduced into the Pacific States and perhaps not native except in the Southeast. Occurs in every State s. of the 40th parallel of latitude and sparingly northw., except, perhaps, in Nebr.

DESCRIPTION: A tufted annual, branching in two ranks from the base. Stems slender and erect, often woolly at the base, 8 to 24 in. high. Leaf-blades slender, lax, usually spirally inrolled, 1 to 6 in. long; leaf-sheaths loose. Spikelets few, borne in a loose spike-like raceme or a narrow panicle. Glumes of approximately equal length, the 2d or upper glume sometimes longer and bearing an awn 1-6 to 1-3 in. long. Lemma shorter than the 1st glume, its awns about equal in length, the middle one sometimes the longest, from 1 to 3 in. long. Also called Annual triple-awn and Few-flowered three-awn.

HABITAT: In pine barrens of the S. E. States and in poor soils generally. On the Coconino N. F. it occurs "scattered over lower Y. P. and upper woodland types. Found occasionally on dry rocky slopes forming small mats or tufts."

FLOWERING PERIOD: June to Aug. Given as Aug. on the Coconino N. F.

SEED DISSEMINATION: July to Oct. Given as Sept. on the Coconino N. F.

FORAGE VALUE: Reported from the Coconino N. F. to be "eaten only to a small extent. Awns prevent stock from eating mature plants. It is not relished at any stage of its growth." In the uplands of the northern pine region of La. and Miss. this species forms a large part of the native forage and is, in many places, an important constituent of the spring and early summer herbage, but is not grazed after this period.

Aristida palmeri Vasey

Palmer's three-awn

RANGE: Ariz., extreme s. Cal., Lower Cal. and, in Mex., from Chihuahua to Puebla.

DESCRIPTION: An erect, tufted perennial, 6 to 24 in. high. Leaf-blades numerous, but very narrow, inrolled, 2 to 6 in. long. Panicle open, the branches mostly in pairs, ascending or stiffly spreading, spikelet-bearing towards the ends. Glumes tapering-pointed, about equal in length. Lemma 1-2 in. long, slightly longer than the glumes, the neck with a decided twist. Awns unequal, the middle one spreading, 1-4 to 1-2 in. long, the laterals erect and about 1-8 to 1-3 in. long. Sometimes called Tall three-awn.

HABITAT: Reported from the Tusayan N. F. as growing in "sandy soil, in woodland type, at 5,500 ft. elevation and, no doubt, lower, growing with grama, Texas timothy (*Lycurus phleoides*), etc."

FLOWERING PERIOD: Given as June and July, Tusayan N. F.

SEED DISSEMINATION: Given as July and Aug., Tusayan N. F.

FORAGE VALUE: Reported "worthless" on the Tusayan N. F.

***Aristida reverchoni* Vasey**

Reverchon's three-awn

RANGE: S. Cal., Ariz. and N. Mex. to w. Tex.

DESCRIPTION: A densely tufted, erect perennial, 1 to 2 ft. high. Leaf-blades somewhat flexuous, spirally inrolled, 6 in. long or less. Panicles many-flowered, narrow, strict and spike-like, often numerous, 3 to 6 in. long, the branches short and erect. Glumes awnless, smooth or nearly so, the lower one about 1-4 in. long, and the upper one about 5-12 in. long. Lemma about 1-2 in. long, smooth except at the base, narrowed above into a slender but not twisted neck. Awns approximately equal, about 5-6 in. long. Also called California poverty-grass, Southwestern triple-awn and Tall three-awn grass.

HABITAT: Deserts and dry plains.

FLOWERING PERIOD: More data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: In the rocky and desert soils of the Southwest this plant, according to Pringle, "supplies in its thin scattered tufts dainty bits seized upon by stock with avidity." Reported from the Apache N. F. as "fair forage." The awns, of course, are apt to be bothersome to stock.

***Aristida scabra* (H. B. K.) Kunth**

Scapose three-awn

RANGE: In extremely southern U. S., the range not yet defined with precision. Known to occur in Fla., s. Ariz. and s. N. Mex. and through Mex. to Centr. Am.

DESCRIPTION: A peculiar species, perennial, from a creeping rootstock; stems unjointed except at the base, 1 to 3 ft. high, scape-like, i. e., with no leaves except at the base. Leaf-blades very narrow, often bristle-like. Panicle large, open, spreading, 6 to 8 in. long, the branches naked below, single or in 2's to 5's. Spikelets erect or ascending; glumes awn-pointed, about 5-12 in. long, the lower glume a little longer than the upper. Lemma about 5-12 in. long, not twisted at the neck; awns straight or somewhat wavy, the middle awn 3-4 to 1 in. long, the laterals shorter, from 1-6 to 1-2 in., though occasionally rudimentary or, apparently, even wanting. Stamens, only 2.

HABITAT: Sandy coasts, dry hills, sterile clays and limestone soils, rocky foothills and mesas among cactus, and the like.

FLOWERING PERIOD: No data available.

SEED DISSEMINATION: No data available.

FORAGE VALUE: No data available.

***Aristida schiedeana* Trin. & Rupr.**

Single-awned aristida

RANGE: From extreme w. Tex. through most of N. Mex. and s. Ariz. into Mex. It apparently does not occur in s. Cal.

DESCRIPTION: An erect perennial, 1 1-2 to 2 1-2 ft. high. Leaf-blades smooth, narrow, inrolled, 6 to 12 in. long. Panicle somewhat loose, frequently purplish, 4 to 12 in. long, the branches solitary or in pairs, distant, 2 to 5 in. long, ascending or spreading, rigid, often 1-sided, flowering usually beyond the middle. Peculiar in this genus in not having the characteristic "triple awn," the 2 lateral awns or awn-branches being absent or, if present, extremely short; middle awn spreading and 1-3 to 1-2 in. long.

HABITAT: Often associated with Texas poverty-grass (*A. divaricata*) which, except for the awns, it greatly resembles, growing scatteringly over mesas and foothills and, in the mts., up to about 7,000 ft.; more abundant at the lower elevations.

FLOWERING PERIOD: Aug.

SEED DISSEMINATION: Sept.

FORAGE VALUE: Grazed, if at all, in the summer and fall seasons; later it becomes too wiry and the awns become troublesome.

Asperella hystrix (L.) Humb. See *Hystrix hystrix* (L.) Millsp.

AVENA

The genus to which cultivated Oats belongs, and the type of the *Aveneae* or Oat tribe of the Grass family. Annuals or perennials, usually with flat leaf-blades and panicle spikelets, the latter relatively large and usually 2 to 6-flowered, the lower florets perfect, the upper ones often staminate or rudimentary. Glumes somewhat unequal in length, membranous, persistent, many-nerved, longer than the lemmas and usually overtopping the uppermost floret. Lemmas 2 to many (rarely 1), deciduous, rounded on the back, sharp-tipped, the apex, however, often 2-toothed, somewhat thickened except toward the apex, 5 to 9-nerved, and bearing on the back a long, twisted awn, although there are some cultivated varieties of beardless and straight-awned Oats. Palea narrow, 2-toothed at the apex. Grain oblong, deeply furrowed, enclosed in the lemma and palea, to the latter of which it often adheres. There are about 50 species known, mostly natives of the Old World, especially in the temperate and cooler portions. There are only about 3 native American species, although several introduced species are now well established on this continent.

Avena americana Scribn.

American oats

RANGE: From Sask. and Man. to Colo. Most abundant in the upper part of the e. Rocky Mt. region.

DESCRIPTION: A smooth, rigidly erect perennial bunchgrass, 4 in. to 2 ft. high, with narrow, firm, mostly basal leaves, 2 to 6 in. long, the sheaths longer than the internodes. Ligule translucent, blunt-pointed, 1-6 in. long. Panicle rather narrow, fairly compact, almost spike-like, 2 to 5 in. long; spikelets 4 to 5-flowered, about 7-12 in. long. Glumes lance-shaped, somewhat rough on the keel, about as long as the spikelet; lemmas smooth, about 1-2 in. long; awns about 1-2 in. long.

HABITAT: In grassy parks of the foothills and mts., in medium dry bottomlands, open thickets and prairies. "Seldom found below 6,000 ft. in Mont. and Wyo." In Colo. (fid. Rydberg) it occurs between 5,000 and 8,000 ft., although rare (fid. Williams) below about 7,500 ft. Usually local in distribution.

FLOWERING PERIOD: June to Aug.

SEED DISSEMINATION: July to Sept.

FORAGE VALUE: "Not widely distributed in N. Dak.; when present it furnishes valuable forage." Sparsity is the one fault of this grass; many experts deem it well worthy of cultivation.

***Avena barbata* Brot.**

Barbed oats

RANGE: A native of the mts. of s. Europe; now widely distributed in Cal., especially in the Coast Range and in the southern part of the State. Also in Lower Cal.

DESCRIPTION: An annual. Stems 2 to 3 1-2 ft. high, erect and slender. Leaves 1-4 in. broad or less, rough on both surfaces. Panicle 6 to 12 in. long, shorter in dry localities and in dry seasons. Spikelets mostly 2-flowered, narrow, on curving thread-like pedicels. Lemmas pubescent with rather long hairs, 7-nerved, about 5-6 to 1 in. long, including the long, slender, awn-pointed teeth; awn arising from near the middle of lemma, stout, abruptly bent, 1 to 1 1-2 in. long.

HABITAT: Fields and waste places; a common weed.

FLOWERING PERIOD: Feb. to Aug.

SEED DISSEMINATION: Apr. to Oct.

FORAGE VALUE: Notes on this species are not available. It is quite probable, however, that, on the range, the young plants, before the awned spikelets mature, may be valuable for forage.

***Avena fatua* Linn.**

Wild oats

RANGE: A native of s. Europe, w. Asia and n. Africa, but now widely distributed over grain-growing countries. Rare on the Atlantic seaboard of the U. S. It is especially common in s. Cal., but it is found in all three Pacific States and has spread eastw. as far as Minn. and N. Mex. It is reported to be a troublesome weed in many parts of Mont. It also occurs in Mex.

DESCRIPTION: An annual; stems 1 to 3 ft. high, stout and erect. Leaf-blades flat, long, broad, and rough to the touch. Panicle open, the slender branches usually horizontally spreading. Spikelets 2 to 3-flowered; glumes about 1 in. long; lemmas 9-nerved, about 5-6 in. long, clothed with long, stiff, brownish hairs; awns stout, bent, red-brown, twisted below, about 1 1-2 in. long. As hinted in the scientific specific name, as well as in appearance, this species is very closely related to cultivated Oats (*A. sativa*) from which it differs mainly in its longer panicle, densely hairy instead of smooth lemmas, and the fact that the florets readily fall from the glumes.

HABITAT: Grain fields and waste places. Reported from the Trinity N. F. that it "will grow on varied soils and will thrive on the most dry and exposed slopes." Throughout foothills of s. Cal. and at lower elevations in Sierras and Coast Range.

FLOWERING PERIOD: May to Aug.

SEED DISSEMINATION: June to Sept.

FORAGE VALUE: The young plants, before the awned spikelets mature, are good forage. It sometimes occurs in the foothills of s. Cal. in almost pure stands, and it is often cut for hay. Makes a good quality of fodder and is much employed for this purpose in Cal. It is an excellent early feed for all classes of stock, but poor when dry.

***Avena fatua glabrata* Peterm.**

Smooth wild oats

A. fatua glabrescens Coss.

RANGE: Same as species.

DESCRIPTION: A variety of *A. fatua* distinguished by its smooth or nearly smooth lemmas.

HABITAT: Same as species.

FLOWERING PERIOD: Same as species.

SEED DISSEMINATION: Same as species.

FORAGE VALUE: Same as species.

***Avena fatua glabrescens* Coss.** See *A. fatua glabrata* Peterm.

***Avena mortoniana* Scribn.**

Alpine oats

RANGE: Mont. to Colo.

DESCRIPTION: A densely tufted, erect perennial, 4 to 16 in. high, usually under 10 in. Roots fibrous. Leaves rather rigid, somewhat narrow, flat or rolled, 2 to 8 in. long. Panicle narrow, erect, almost spike-like; spikelets short-pedicel, 1 or 2-flowered, about 5-12 in. long; spikelets and pedicels frequently purplish. Glumes lance-shaped, the lower 1-nerved, the upper 3-nerved; lemmas 1-3 to 1-2 in. long, 5-nerved, smooth above, the thickened base very conspicuously tufted with white hairs; awn twisted below, 1-2 to 2-3 in. long. Very closely allied to American oats (*A. americana*) and distinguished mainly by its smaller size, shorter panicles and smaller, fewer-flowered spikelets. Known also as Morton's oat-grass.

HABITAT: Typically in alpine to subalpine situations. Rydberg gives its range in Colo. as "mt. tops, 13,000 to 14,000 ft." Scribner gives its elevation in the same State as "11,700 to 12,600 ft." Collected on the Lewis & Clark N. F. in a dry gravelly soil, s. slope, at 5,100 ft.

FLOWERING PERIOD: July.

SEED DISSEMINATION: Aug. and Sept.

FORAGE VALUE: Palatable to stock but usually occurring very scatteringly and its typical habitat, at alpine elevations, often prevents its utilization.

***Avena sativa* Linn.**

Oats

RANGE: A native of Europe and western Asia, now cultivated in nearly all civilized countries; it is often found escaped from cultivation.

DESCRIPTION: An erect annual, so well known as hardly to require comment. Botanically it is distinguished by its usually 2-flowered spikelets which do not readily separate from the glumes, by its smooth, hairless lemmas, and the fact that the awns are only slightly bent or, in fact, may be quite straight or even absent.

HABITAT: Waste places, road-sides and on open range.

FLOWERING PERIOD: May to Aug., depending on locality.

SEED DISSEMINATION: July to Oct.

FORAGE VALUE: Quite extensively grown in the southeastern States for grazing purposes. The economic use of oats as grain, hay, straw and soiling requires no comment. It might be stated, however, that oats are richer in nitrates than the soft-wheats and contain more ether extract or "fats" than any other cereal.

***Avena striata* Michx.** See *Melica striata* (Michx.) Hitchc.

***Avena torreyi* Nash.** See *Melica striata* (Michx.) Hitchc.

BECKMANNIA

A genus, of the *Chlorideae* or Grama tribe of grasses, composed of a single species.

***Beckmannia erucaeformis* (L.) Host.**

Slough-grass

RANGE: W. Ont. to Iowa, n. N. Mex., Cal. and Alaska.

DESCRIPTION: A stout, erect perennial 1 to 4 ft. tall. Leaf-sheaths longer than the internodes, loose; blades flat, rough, 3 to 9 in. long and 1-6 to 1-3 in. wide. Panicle terminal, 4 to 10 in. long; spikes erect, about 1-2 in. long; spikelets 1 or 2-flowered, globular, flattened, 1-12 to 1-8 in. long, closely arranged in two rows on one side of the rachis, or axis of the spike. Sometimes known as Rattlesnake grass because of the resemblance of the spikes to the rattles of a rattlesnake, also called Caterpillar grass.

HABITAT: In swamps and wet meadows to elevations of about 9,000 feet.

FLOWERING PERIOD: June to Sept.

SEED DISSEMINATION: July to Oct.

FORAGE VALUE: Palatable to horses and cattle throughout all stages of growth and to sheep only in the spring. It produces an abundance of foliage and in some parts of the Rocky Mts. and the Northwest is abundant enough to constitute an important part of the forage of low pasture lands. It is often cut, along with other meadow grasses, for hay.

BLEPHARONEURON

Blepharoneuron is represented by one species and is a member of the *Agrostideae*, the Redtop-Timothy tribe of grasses. It is separated from the other genera of this tribe chiefly by: Lemmas 3-nerved, the nerves densely hairy with long silky hairs for nearly their entire length, and unawned; the glumes not flattened on the back; and the rachilla or floret stalk not prolonged.

Blepharoneuron tricholepis (Torr.) Nash

Beardless pine-grass

Sporobolus tricholepis Torrey

RANGE: Colo. and Utah to w. Tex., centr. Mex. and Ariz.

DESCRIPTION: A fibrous-rooted, slender, erect, densely tufted perennial 10 to 24 in. high. Leaves narrow, smooth, 2 to 8 in. long, the uppermost often sheathing the panicle and equaling or extending beyond it. Panicle somewhat open and spreading 2 to 6 in. long; spikelets 1-flowered, about 1-10 to 1-8 in. long. Known also as Beardless mountain bunchgrass.

HABITAT: Usually on rocky soil in timber and brush or in parks, generally at middle elevations, but in Colo. extending from 6,000 to 12,000 feet.

FLOWERING PERIOD: July to Sept.

SEED DISSEMINATION: Aug. to Oct.

FORAGE VALUE: Very palatable to all classes of stock. It generally produces considerable foliage and while it is a secondary species in abundance it often occurs in sufficient quantity to form a large part of the forage.

BOUTELOUA

The gramas, as the species of *Bouteloua* are commonly called, are annual or perennial, bunched or stoloniferous grasses of the *Chlorideae* or Grama tribe. The genus *Bouteloua* is a variable one in every detail. Spikes 1 to 60, arranged in one-sided racemes; spikelets sessile in 2 rows along 1 side of a flat rachis or axis, with one perfect floret and a sterile, rarely staminate (male), floret and sometimes a second or third rudiment present.

As forage plants the gramas are generally very nutritious. They form the principal part of the forage in the Great Plains region and in most parts of the Southwest. There are about 35 species occurring from Sask. and Man. far into S. Am. They are especially abundant in n. Mex. and the s. w. U. S.

***Bouteloua aristidoides* (H. B. K.) Griseb.**

Needle grama

RANGE: From w. Tex. through N. Mex. and Ariz. to s. Cal., s. into S. Am.

DESCRIPTION: A tufted, much branched, erect or spreading annual with stems up to 2 ft. in height. Leaves few, narrow and about 3-4 to 1 1-2 in. long. Spikes several, usually 10 to 12, about 1-2 to 3-4 in. long, when mature they drop off entire; spikelets 1 to 4, loosely arranged, the first, half as long as the second, each spikelet consisting of a perfect floret and a rudiment; lemmas 3-nerved, the nerves slightly hairy, the lateral ones ending in awned teeth as long as the central tapering point.

HABITAT: Common on bottoms, and the drier desert mesas and foothills. Often in pure stands in sandy soil. A very drought resistant species.

FLOWERING PERIOD: Aug. and Sept.

SEED DISSEMINATION: Sept. and Oct.

REPRODUCTION: An abundance of seed is produced and as the entire spike bores, by means of the awns, into the ground this species reproduces well.

FORAGE VALUE: When young and fresh it is grazed by stock but it pulls up easily at this time. After it begins to ripen stock avoid it because the awns cause the spikes to injure their mouths and in the case of sheep their feet also.

***Bouteloua barbata* Lag.**

Tall annual-grama

B. polystachya Torr.

RANGE: Utah to s. Cal., Tex. and s. Mex.

DESCRIPTION: An exceedingly variable annual, erect when growing thickly but prostrate when scattered, 2 to 12 in. high, slender and sparingly branched. Leaves flat, about 1-2 to 3 in. long. Spikes several, usually 4 to 6, about 1-2 to 3-4 in. long; spikelets 25 to 40, about 1-8 in. long; lemmas 4-lobed, 3-awned, the central awn arising between the lobes; 3-nerved, the nerves hairy.

HABITAT: In dry desert and gravelly soils usually under brush, up to 5,000 ft. elevation.

FLOWERING PERIOD: July to Sept.

SEED DISSEMINATION: Sept. and Oct.

REPRODUCTION: Seeds are produced in great numbers.

FORAGE VALUE: Of good quality and frequently produces a good deal of forage at a time when most other forage is gone so that it is important in such places.

***Bouteloua curtipendula* (Michx.) Torr.**

Side-oats grama

RANGE: From Conn. and N. J. to Ont., e. Mont., Utah, s. Cal. and Tex. and s. through Tenn. to Ala. Also extends through Mex. and Centr. Am. into S. Am.

DESCRIPTION: A tufted, erect perennial with tough fibrous roots and strong scaly creeping rootstocks. Stems 1 to 4 ft. high. Leaves abundant, 4 to 12 in. long. Panicle 6 to 12 in. long, consisting of 25 to 50 spikes, 1-4 to 3-4 in. long, arranged alternately on an elongated axis, mostly turned to one side; spikelets 5 to 8, arranged on one side of the flattened rachis, but not pectinate.

HABITAT: On plains and dry rocky hills to an elevation of 7,000 ft. In Ariz. it makes its best growth in alluvial soils at elevations of from 4,000 to 6,000 ft. and occurs only in scattering stands at higher and lower elevations than these.

FLOWERING PERIOD: May to Oct.

SEED DISSEMINATION: July to Nov.

REPRODUCTION: Produces much seed which is difficult to separate from the chaff. Spreads principally by strong creeping rootstocks.

FORAGE VALUE: Important forage in the arid and semi-arid regions of the West, for all classes of stock. It is readily eaten at all times and makes good winter

pasturage. Abundant west of Ill. and in alluvial bottoms and on foothills in Ariz. forms a nearly pure stand. Occasionally cut for hay in the Plains and Southwest regions.

***Bouteloua eriopoda* Torr.**

Black grama

RANGE: W. Tex. to s. Ariz. and s. into Chihuahua.

DESCRIPTION: A slender branching, strong rooted perennial commonly in tufts or occasionally a weedy annual. Stems woolly, somewhat wiry, 4 to 24 in. high. Leaves smooth, narrow, and inrolled. Spikes 3 to 8, commonly 4 or 5, about 1 in. long; spikelets 12 to 20, about 1-3 in. long, loosely pectinate. This species is easily recognized by the loosely pectinate inflorescence and woolly stems. Locally called Woolly foot or Wire grama.

HABITAT: In open on dry sandy or gravelly soil at elevations of from 3,500 to 5,000 ft., often in pure stands.

FLOWERING PERIOD: Aug. and Sept.

SEED DISSEMINATION: Sept. and Oct.

REPRODUCTION: Spreads slowly by runners but where heavily grazed hardly spreads at all. The seeds do not germinate well.

FORAGE VALUE: Wherever it grows abundantly it forms dense and excellent pasturage. It is sometimes cut for hay.

***Bouteloua filiformis* (Fourn.) Griff.**

Slender grama

RANGE: S. Tex. to s. Ariz. and s. to Colombia.

DESCRIPTION: An erect, or sometimes bent at the nodes, tufted and spreading perennial with a rather limited root system. Stems 12 to 20 in. high. Leaves narrow and delicate. Spikes usually 7 to 9, one-sided, about 1-3 in. wide and 3-4 in. long with about 10 spikelets not pectinate, consisting of one fertile floret and an upper staminate (male) one.

HABITAT: In dry deserts or in fertile soils under brush.

FLOWERING PERIOD: More data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: Excellent forage though seldom very abundant.

***Bouteloua gracilis* (H. B. K.) Lag.**

Blue grama

B. oligostachya Torr.

RANGE: From Alb. and Man. to Utah and s. Cal. on the west, Minn. and Mo. on the east, and s. into S. Am.

DESCRIPTION: A stout, erect, smooth, perennial from strong rhizomes, forming a rough sod in the North, and usually isolated tufts in the South. Stems branched only at the base if at all, usually 6 to 18 in. high but sometimes 2 1-2 ft. in favorable situations. Leaves rather abundant, flat, often forming a curly covering close to the ground. Spikes normally 2, though often 1 to 3, seldom as many as 6, 1 to 2 in. long, commonly curved in age, rachis not projecting; spikelets about 1-4 in. long, densely crowded, pectinate, as many as 80; glumes sparsely hairy; lemmas hairy, 4-lobed, with 3 short awns, the lateral ones terminating the two outer lobes, the central awn from between the two central lobes.

HABITAT: Plains and prairies up to 8,000 ft. though it makes its best growth at about 5,000 ft. in s. Ariz. and in the highlands of Mex.

FLOWERING PERIOD: June to Sept.

SEED DISSEMINATION: Aug. to Oct.

REPRODUCTION: Seeds well and reproduces rather extensively by seed under favorable conditions. Also spreads vegetatively.

FORAGE VALUE: Undoubtedly the most important grass of the Great Plains and Southwest regions. It is excellent forage for all classes of stock. In the Plains region produces fresh feed as early as May and matures in Aug.; in s. Ariz. and Mex. it starts growth about the middle of July and matures in late Sept. or Oct. It retains much of its nutriment when cured and consequently makes excellent winter pasturage. It is very drought resistant and withstands trampling well.

Bouteloua hirsuta Lag.

Hairy grama

RANGE: From Ill. and S. Dak. to Utah and s. Cal., s. Mex. and Tex. Also in Fla.

DESCRIPTION: A tufted, rigid, erect, fibrous-rooted perennial of variable habit, size, and general appearance, forming a sod in its northern range and growing in isolated clumps in the southern part. Stems rather rigid, stout, unbranched, 8 to 18 in. high. Leaves smooth, narrow, flat, and somewhat beset with stiff hairs, especially the margins. Spikes 1 to 4, 2-3 to 2 in. long with the rachis projected about 1-3 in. beyond the last spikelets; spikelets 35 to 45, pectinate; glumes roughened; lemmas 3-lobed, the lobes awn-pointed, conspicuously hairy.

HABITAT: On dry prairies, sandy plains and gravelly rolling slopes of high mesas. Reaches its best development upon stable sandy loam soils. In Colo. up to 7,000 ft. in elevation.

FLOWERING PERIOD: July to Sept.

SEED DISSEMINATION: Sept. and Oct.

FORAGE VALUE: Excellent forage for all classes of stock being similar in quality to blue grama. Especially valuable for winter forage. It is more drought-resistant than blue grama, so fills an important place on the drier, lower elevations and sandy plains.

Bouteloua oligostachya Torr. See *B. gracilis* (H. B. K.) Lag.

Bouteloua polystachya Torr. See *B. barbata* Lag.

Bouteloua procumbens (Durand) Griff.

Prostrate grama

B. prostrata Lag.

RANGE: Colo. and Utah to S. Am.

DESCRIPTION: A small smooth, tufted, prostrate or ascending, sparingly branched, fibrous-rooted annual. Stems 2 to 10 in. high. Leaves few, narrow, 1-2 to 1 1-2 in. long. Spikes solitary 1-2 to 1 in. long, with fertile pectinately arranged spikelets to the end of the rachis.

HABITAT: Generally in bottom lands on alluvial soils and in parks in the timber at elevations of from about 5,000 to 8,500 ft.

FLOWERING PERIOD: June to Oct.

SEED DISSEMINATION: Aug. to Nov.

FORAGE VALUE: Of little value on account of its size and the ease with which it pulls up when grazed.

Bouteloua prostrata Lag. See *B. procumbens* (Durand) Griff.

Bouteloua radicata (Fourn.) Griff.

Purple grama

Dinebra bromoides H. B. K.

not *B. bromoides* Lag. though the latter is given as synonymous with *Dinebra bromoides* by a number of authors.

RANGE: From s. Cal. to N. Mex. and s. Mex.

DESCRIPTION: A stout, erect, tufted, long-lived perennial with stout rhizomatous base, usually in isolated bunches, but occasionally in continuous patches in the

southern portion of its range. Stems unbranched, 1-2 to 2 1-2 ft. high. Leaf-sheaths close, strongly ridged; blades abundant below, flat, 3 to 7 in. long, mostly 1-12 to 1-8 in wide, with regularly disposed minute hairs on the edges. Spikes several to many, loose, 3-4 to 1 in. long, irregularly 1-sided; spikelets 1-3 to 1-2 in. long, consisting of 2 florets, the lower perfect, the upper either pistillate (female) or perfect; lemmas smooth, bone-like, about 1-3 in. long, the lower with 3 short awns, the lemma of the upper floret with 3 long awns.

HABITAT: Upper foothills and mts.; often associated with blue grama and side-oats grama.

FLOWERING PERIOD: Sept.

SEED DISSEMINATION: Oct.

FORAGE VALUE: Excellent forage for all classes of stock. Generally it is not abundant, but in places it is abundant enough to be of some importance.

***Bouteloua rothrockii* Vasey**

Rothrock's grama

RANGE: S. Utah through Ariz. and s. Cal. to Sinaloa, Mex.

DESCRIPTION: A tufted, erect, sparingly branched, smooth, short lived perennial from a poorly developed root system. Stems 1 to 2 ft. high. Leaves abundant toward base of stems, 2 to 4 in. long. Spikes 4 to 12, usually 4 to 6, 1-2 to 1 1-2 in. long; spikelets pectinate 40 to 50; lemmas loosely hairy with long white hairs, 4-lobed with awns arising between the lobes. Locally called Crowfoot grama and Mesa grama.

HABITAT: Upper mesas and gentle open slopes of the foothills, often in pure stands at elevations of from 1,500 to 5,000 feet.

FLOWERING PERIOD: Aug. and Sept.

SEED DISSEMINATION: Sept. and Oct.

FORAGE VALUE: In some localities it is the most important grass on the range. It is very nutritious and is readily eaten by all classes of stock. It sometimes occurs abundant enough to be cut for hay. It does not stand continued drought, nor close grazing since it is easily pulled up and tramped out.

***Bouteloua trifida* Thurb.**

Small grama

B. trinii (Fourn.) Griff.

RANGE: Centr. and s. Tex. to Ariz. and centr. Mex.

DESCRIPTION: A variable, low, delicate tufted perennial from a short rootstock. Stems, nearly naked, unbranched, 4 to 12 in. high, erect or bent at the base. Leaves narrow, smooth or sparsely hairy, basal sometimes 2 to 3 in. long, the stem leaves often only 1-4 in. long. Spikes 3 to 7 ascending, about 1 in. long, bearing about 12 pectinately arranged spikelets about 1-3 in. long; lemmas hairy.

HABITAT: Sandy plains, mesas, rocky knolls and ridges and also in the alluvial soils of shallow ravines. Often forms pure stands at elevations below 4,500 feet.

FLOWERING PERIOD: May to Oct.

SEED DISSEMINATION: July to Oct.

FORAGE VALUE: An excellent forage, eaten readily by all classes of stock.

***Bouteloua trinii* (Fourn.) Griff.** See *B. trifida* Thurb.

BRIZA

Annual or perennial grasses of the *Festuceae*, Fescue-Bluegrass-Brome tribe. There are about 12 species native in the temperate regions of Europe, North Africa, Mexico and South America and certain species have been introduced in the U. S.

The genus *Briza* is characterized by: Spikelets several-flowered, flattened, in panicles; glumes membranaceous, with broad dry margins, strongly concave; lemmas 3 to many-nerved.

Briza minor L.

Quaking grass

RANGE: A native of Europe. Now rather common from N. J. to Va. in the East, and centr. Cal. to Brit. Col. in the West.

DESCRIPTION: An annual with smooth, erect stems 4 to 15 in. high. Leaf-sheaths shorter than the internodes; the blades 1 to 5 in. long, 1-12 to 1-3 in. wide, sometimes rough. Panicle 2 to 5 in. long, open, the main branches stiffly ascending, the slender branchlets spreading, 1 to 2 1-2 in. long; spikelets numerous, drooping, 3 to 6-flowered, 1-12 to 1-8 in. long and about 1-6 in. broad.

HABITAT: Waste places.

FLOWERING PERIOD: June and July.

SEED DISSEMINATION: June to early Aug.

FORAGE VALUE: Little known in this country but as it is smaller and more delicate than *B. media*, which is classed as a valuable meadow grass in middle Europe, it is probably quite palatable.

BROMUS

The species belonging to this genus number about 100, some 40 of which occur in the United States, including 18 introduced species. Twenty-two species occur in Cal., 22 in Oreg., and 19 in Wash., while in Idaho, Mont., Colo. and N. Mex. less than half that many have been reported.

They are annual, biennial or perennial grasses with flat leaves and large, open, more or less nodding panicles; erect spikelets with 5 to 15 large flowers, perfect except the uppermost; glumes about equal, 2-3 the length of the adjacent florets, acute or obtuse, the first 1 to 3-nerved, the second 3 to 9-nerved; lemmas rather rigid, convex or keeled, acute, toothed or obtuse, short-awned or awnless; paleas usually slightly shorter than the lemmas, 2-keeled. Stamens usually 3; stigmas plumose and sessile.

Brome-grasses belong to the same grass tribe, *Festuceae*, as the well-known *Poa* (bluegrasses), *Festuca* (fescues) and *Dactylis* (orchard-grasses) genera.

Because of the rank growth characteristic of several species there is a wide variation in the forage value of brome-grasses. Several mountain species furnish first-class summer and autumn forage and a few, mainly those introduced, produce heavy herbage in the meadow lands.

Bromus arenarius Labill.

Australian brome-grass

RANGE: Native of Australia and introduced into Cal.; found chiefly in the San Bernardino Mts. to Mariposa and San Mateo Cos.

DESCRIPTION: A slender-stemmed grass with flower stalks 6 to 18 in. high; sheaths and leaf-blades clothed with soft fine hairs; panicles pyramidal, open, nodding, the spreading branches and slender pedicels curving in and out; glumes densely hairy, sharp-pointed, papery-margined, the first narrower, 3-nerved, 1-3 in. long, the second 7-nerved, 5-12 in. long; lemmas densely fine-hairy, 7-nerved, 1-2 in. long or slightly less, 2-toothed at apex; awn straight, about 1-2 to 2-3 in. long.

HABITAT: Dry sandy roadsides and gravelly or sterile, dry hillsides.

FLOWERING PERIOD: No data available.

SEED DISSEMINATION: No data available.

FORAGE VALUE: While relished by all classes of stock, it produces relatively few leaf-blades, and since its distribution is much limited and the stand scattered, it furnishes but a small amount of range forage.

Bromus brizaeformis Fisch. & Mey.

Rattlesnake-grass

RANGE: Introduced from Europe. Found scatteringly in various parts of the U. S.; most abundant along the Pacific Coast, limitedly in the Rocky Mts.; in the Northwest e. of the Cascade Mts. only; in the East from Mass. to Del., Mich. and Ind.

DESCRIPTION: A shallow-rooted, erect annual with slender stems 6 to 24 in. high, smooth or slightly pubescent at the nodes; sheaths and leaf-blades covered with soft fine hairs; panicles 2 to 6 in. long, loose, nodding; spikelets oblong to ovate, laterally much compressed, 7-12 to 1 in. long, about 1-2 in. wide; glumes broad, obtuse, smooth or slightly rough, the first 3 to 5-nerved, about 1-2 the length of the second glume, which is broader, 5 to 9-nerved, and about 1-3 in. long; lemmas 5-12 in. long, very broad, smooth, with a broad papery margin, awnless or nearly so.

HABITAT: Sandy and loose clay loam soils; along the margin of cultivated fields and in waste places usually between 3,000 and 6,000 feet.

FLOWERING PERIOD: May to July.

SEED DISSEMINATION: June to August, mainly.

The dissemination of the seed is accomplished by physical means other than the mere expansion of the lemmas. Wind and animals, bending or striking the flower stalks are instrumental in causing the seed to "rattle" out. Anybody who has walked through a mature patch of this grass has noticed the seeds flying in all directions along his path. The dry seeds, loosely held in the harsh lemmas, rattle vigorously as the heads sway, thus the common name "rattlesnake-grass." In places protected from wind and grazing part of the seed crop is usually held until late in autumn.

REPRODUCTION: The plant being an annual, the only means of reproduction is by seed. The seed habits are strong and the viability of the seed, at least in the Northwest is high.

FORAGE VALUE: Being an early maturing plant and having relatively few leaf-blades, it furnishes only a small amount of forage palatable only in the forepart of the season; even then it is grazed only limitedly by stock. Cattle, sheep and horses appear to take it with equal relish. It is among the least valuable of the brome-grasses.

Bromus carinatus Hook. & Arn.

Keeled brome-grass

RANGE: Wash. and Idaho to Cal. and n. Ariz.

DESCRIPTION: Annual in the southernmost limits of its distribution and perennial in the north; root system of the former somewhat limited and shallow, of the latter deep, fibrous and spreading; stems erect, 2 to 3 ft. high, the sheaths velvety with soft hairs; leaf-blades narrow, 4 to 10 in. long, flat, more or less hairy; panicle pyramidal, somewhat drooping; spikelets about an in. long, 5 to 9-flowered; glumes sharp-pointed, smooth or somewhat rough and hairy, the first 3-nerved, about 1-3 of an in. long, the second 5-nerved, over 1-3 of an in. long; lemmas sharp-pointed, minutely hairy, about 1-2 to 2-3 of an in. long; awns about 1-3 in. long.

The species resembles *B. marginatus* but differs essentially, so far as external characters are concerned, in having longer awns and notably narrower leaves.

HABITAT: Open lands, open moist woods, roadsides and waste places; grows best in fairly deep fertile soils.

FLOWERING PERIOD: May to July.

SEED DISSEMINATION: June to Aug.

REPRODUCTION: Mainly from seed.

FORAGE VALUE: The leaf-blades are somewhat harsh and stiff and consequently the herbage is not highly relished by stock. It is eaten by all classes of stock early in the season before the foliage becomes fibrous.

Bromus carinatus californicus (Nutt.) Shear California keeled brome-grass

RANGE: Northern Ariz. and Cal.; in the latter State, more common in the Coast Ranges and n. part than in the Sierra Nevada and s. part.

DESCRIPTION: A form intermediate between typical *B. carinatus*, and *B. carinatus hookerianus*, differing from the former in its nearly smooth leaves and sheaths, and its merely rough, not hairy lemmas. From the latter it differs in its narrower spikelets, glumes and lemmas.

HABITAT: Alluvial soils preferably of more than average moisture. Collected between 6,500 and 7,500 ft. on the Coconino N. F.

FLOWERING PERIOD: Aug.

SEED DISSEMINATION: Sept.

FORAGE VALUE: Grazed by all classes of stock with at least average avidity.

Bromus carinatus hookerianus (Thurb.) Shear Hooker's keeled brome-grass
B. hookerianus Thurb.

RANGE: In Cal. the distribution is the same as *B. carinatus californicus* though less common. Also found occasionally in w. centr. Nev., Oreg., Wash. and Idaho.

DESCRIPTION: A robust plant, larger in all its parts than the species. Distinguished from the species by its smooth sheaths and from the variety *B. carinatus californicus* by spikelets as broad as in the species.

HABITAT: Occupies fairly well disintegrated soils of more than average fertility and moisture.

FLOWERING PERIOD: Aug.

SEED DISSEMINATION: Sept.

FORAGE VALUE: Grazed by all classes of stock, but never taken in preference to species of first forage rank. Of little importance on the range.

Bromus ciliatus L. Long-awned brome-grass

RANGE: In the mountains of Cal., Oreg. and e. to centr. Mont. and Yellowstone Park, Wyo.

DESCRIPTION: A stout-rooted perennial, 3 to 5 ft. high; leaves long-pointed from a broad base, sometimes 1-2 in. wide, smooth or densely pubescent as in the case of the sheaths; panicle compound and very loose, or narrow with short, mostly erect branches; spikelets about 1 in. long, 7 to 12-flowered; glumes sharp-pointed, the upper more than half the length of the lowest lemma; awns 1-4 to 1-2 in. long. A widely variable species.

HABITAT: Alluvial meadows and waste places between 6,000 and 9,000 ft.; not very abundant.

FLOWERING PERIOD: Aug.

SEED DISSEMINATION: Sept.

FORAGE VALUE: Grazed with average relish by cattle and horses but too coarse for sheep except in the forepart of the season.

Bromus ciliatus purgans (L.) Gray. See *B. purgans* L.

Bromus commutatus Schrad. Drooping brome-grass

B. racemosus commutatus (Schrad.) Hooker f.

RANGE: Wash. and Mont. to Cal. and Wyo.; also in the Eastern States. Introduced from Europe.

DESCRIPTION: A shallow-rooted annual or bienial; 1 to 2 ft. tall, typically with a rather small panicle; stems finely hairy; spikelets large; lemmas with a wide (obtuse) angle on the margin just above the middle; awn straight and about 1-2 in. long. The species closely resembles cheat (*B. secalinus*) but differs essentially in having a more drooping panicle and hairy instead of smooth sheaths.

HABITAT: A weed in fields and waste places. Often common.

FLOWERING PERIOD: July and Aug.

SEED DISSEMINATION: Aug. and Sept.

REPRODUCTION: By seed. Viability of seed crop good, at least in some localities, and seed habits strong.

FORAGE VALUE: At no time in the season is this grass readily grazed by any class of stock provided other palatable forage is available. It is grazed limitedly, however, in the spring of the year when succulent. Unusually few leaf-blades are produced, the plant "going mainly to stems."

Bromus grandis (Shear) Hitchc.

Tall brome-grass

B. orcuttianus grandis Shear

RANGE: Cal. (San Diego to Madera and Monterey Cos.) n. to Oreg. and Wash.

DESCRIPTION: Stems 3 to 5 ft. high; sheaths hairy; leaf-blades hairy; elongated and spreading; panicle broad, open, the branches slender and drooping, naked below, the lower usually in pairs, as much as 6 in. long; first glume usually distinctly 3-nerved; lemmas densely pubescent over the back. Resembles *B. orcuttianus hallii*, from which it differs in the open drooping panicles and the more distinctly 3-nerved first glume.

HABITAT: Dry hillsides of moderate elevation.

FLOWERING PERIOD: No data available.

SEED DISSEMINATION: No data available.

FORAGE VALUE: Nothing definite is known as to the forage value of this plant but the foliage of specimens examined is abundant and of fine texture so it is probably grazed with relish. The distribution is limited and the stand usually not dense, however, so the plant is not highly important from the grazing viewpoint.

Bromus hookerianus Thurb. See *B. carinatus hookerianus* (Thurb.) Shear.

Bromus hordeaceus L.

Soft cheat

RANGE: This species enjoys an unusual distribution from Me. to Wash. and Del. to n. Ariz. and Cal. Most abundant on the Pacific coast. Introduced from Europe.

DESCRIPTION: A shallow-rooted annual with erect stems, 8 to 36 in. tall, sheaths finely hairy and the leaf-blades hairy; panicle contracted, erect, 2 to 4 in long or sometimes reduced to a few spikelets; glumes broad, obtuse, coarse-hairy or rough-hairy, the first 3 to 5-nerved, the second 5 to 7-nerved, 1-3 in. long, lemmas broad, obtuse, 7-nerved, coarsely or roughly hairy, rather deeply 2-toothed, 1-3 in. or slightly longer, the margin and apex transparent; awns rather stout, 1-3 to 1-2 in. long.

HABITAT: A weed in cultivated soil and waste places. Often conspicuous on overgrazed range lands; elevation about 2,500 to 5,000 ft.

FLOWERING PERIOD: May and June.

SEED DISSEMINATION: June to Aug. The seed is often not dropped immediately upon reaching maturity.

REPRODUCTION: Like most aggressive annuals soft cheat produces a large amount of seed. Seed collected in the Blue Mts. of Oreg. showed high germination strength.

FORAGE VALUE: In the spring of the year this plant is grazed with fair relish by all classes of stock. If kept on soft cheat for several days, however, sheep have been observed to become restless and hard to handle, as though in search of other forage. When succulent it puts on a "soft" fat. Work animals lose in flesh and seem to lack energy if grazed exclusively on this grass in the spring of the year. Later in the season it is much less palatable. In certain localities of Cal. it furnishes a large amount of the foothill herbage and occasionally is made into hay.

Bromus hordeaceus glabrescens (Coss.) Shear. See *B. hordeaceus leptostachys* Beck.

Bromus hordeaceus leptostachys Beck

Smooth soft cheat

B. hordeaceus glabrescens (Coss.) Shear

B. mollis glabrescens Coss.

RANGE: Practically the same as for the species.

DESCRIPTION: Differs from the species in having the spikelets smooth or slightly rough throughout.

HABITAT: In cultivated fields, waste places and deteriorated range lands; 2,500 to 5,000 feet.

FLOWERING PERIOD: May and June.

SEED DISSEMINATION: June to Aug.

REPRODUCTION: New plants form annually from seed. It has strong seed habits, and in association with the species it is particularly conspicuous on deteriorated range lands in Cal., Oreg., and Wash., where it usually flourishes until the more permanent species regain their foothold.

FORAGE VALUE: Same as for the species; of slightly less value generally because of not being as abundant.

Bromus inermis Leyss.

Smooth brome-grass

RANGE: A native of Europe. Long cultivated on the dry plains of Hungary and the Russian steppes. Introduced into the U. S. about 1880 by the Agr. Expt. Sta. of the Univ. of Cal. Now found throughout s. Can. and in the U. S. as far s. as Tenn., n. Ariz. and s. Cal.

DESCRIPTION: An erect perennial with a strong root system and creeping rootstocks; stems 1 1-2 to 5 ft. high, rather stout, smooth; sheaths smooth, blades broad at base and sharp-pointed, smooth or slightly rough. Panicle pyramidal, dense; spikelets erect or somewhat drooping, narrow; glumes smooth, the lower narrow, acute, 1-nerved; the upper 3-nerved; lemmas 5-nerved and awnless or nearly so, sometimes purplish-tipped. Also known as Hungarian brome-grass.

HABITAT: Cultivated fields and waste places of widely different soil and moisture conditions. Extensively cultivated for hay in medium moist lands.

FLOWERING PERIOD: June to early Aug.

SEED DISSEMINATION: July to Sept.

REPRODUCTION: By seed and vegetatively by means of creeping rootstocks; the viability of the seed is generally good.

FORAGE VALUE: The palatability of smooth brome-grass is very high. It is eaten at all times in the year by all classes of stock. While chemical analyses of the herbage do not show as high nutritive qualities as in the case of some

of the best cultivated grasses, stock do remarkably well on it, both when grazed and fed as hay. The creeping rootstocks which bind the soil firmly enable it to withstand grazing fairly well. The strong perennial character of this grass and its unusual drought resistance are qualities which recommend it for general culture and artificial range reseeding, particularly in the semi-arid regions of the West and Northwest. It thrives fairly well on comparatively dry, loose soils, but, of course, the better the soil is the better the yield. It has been reported to yield 3 3-4 tons per acre in the best soils and under good cultural conditions. In artificial range reseeding tests conducted by the Forest Service uniformly better results have been obtained with smooth brome-grass than with any other species except timothy.

Bromus kalmii porteri Coult. See *B. porteri* (Coult.) Nash.

Bromus lanatipes (Shear) Rydb. See *B. porteri lanatipes* Shear.

Bromus marginatus Nees Large mountain brome-grass

RANGE: Wash. to Mont. and w. S. Dak. and s. to Cal. and N. Mex.

DESCRIPTION: A tufted, rather short-lived perennial, with a deep, fibrous, spreading root system; robust growth, rather coarse stems 1 to 4 ft. tall; sheaths clothed with soft, fine hairs. Panicle erect, rather narrow, usually 4 to 8 in. long, the lower branches somewhat spreading in flower, 1 to 3 1-2 in. long; spikelets 1 to 1 1-2 in. long, 7 to 8-flowered; glumes broad, rough or rough-hairy, the first 3 to 5-nerved, about 1-3 in. long, the second 5 to 7-nerved, longer than the first; lemmas somewhat leathery, coarsely hairy, about 1-2 in. long; awns about 1-6 to 1-4 in. long. One of the 4 commonest species of *Bromus* on N. F. ranges. It has been submitted for identification from 33 National Forests and all districts except 3, where it also occurs, however.

HABITAT: From medium to high elevations in friable clay loam and sandy loam soils of medium moist to rather dry, open areas; along banks of streams, common in open aspen-weed type, in canyon bottoms and sides of drainage channels. Not tolerant of dense shade.

FLOWERING PERIOD: July to Aug.

SEED DISSEMINATION: Aug. and Sept.

REPRODUCTION: By seed and limitedly by vegetative means. The seed habits are strong and the viability of the seed probably good in general. In the Blue Mts. of Oreg. the seed at medium elevations had an average germination strength for three successive seasons of 85% and at high elevations, where the growing season is about six weeks shorter, the viability was 47.6%.

FORAGE VALUE: Being a robust plant it is most palatable to all classes of stock before full size is attained; though it is grazed with considerable relish throughout the growing season, and by cattle and horses after seed maturity. Horses and sheep are particularly fond of the heads and these are no doubt very nutritious. When grazed off early in the season it produces a luxuriant aftermath of foliage that is devoured with unusual relish even late in the autumn.

Bromus marginatus seminudus Shear Smooth mountain brome-grass

RANGE: Same as for the species.

DESCRIPTION: Closely resembles the species, but differs in the following particulars: Usually more leafy, but less hairy or, in some cases, nearly smooth throughout. Panicle large, spreading; spikelets with glumes smooth or only slightly rough on the nerves instead of rough or rough hairy throughout; lemmas somewhat rough or rough-hairy.

HABITAT: Medium moist soils; in woods, glades and near streams, mostly from 3,000 to 9,000 ft. Not quite as abundant as the species, though common.

FLOWERING PERIOD: July and Aug.

SEED DISSEMINATION: Aug. and Sept.

FORAGE VALUE: It has the advantage over the species of being more leafy and producing a larger amount of herbage per plant. All classes of stock relish it. Because of the rank growth, however, it is best adapted to cattle and horses.

Bromus mollis glabrescens Coss. See *B. hordeaceus leptostachys* Beck.

Bromus orcuttianus Vasey

Mammoth brome-grass

RANGE: Wash. to s. Cal.

DESCRIPTION: A deeply-rooted perennial with erect culms, leafy below, nearly naked above, 3 to 6 ft. high, pubescent at and below the nodes; sheaths finely hairy, sometimes almost velvety; blades smooth, rather short and erect; panicle narrow-pyramidal, erect, 4 to 7 in. long, the branches few, rather stiff in fruit; spikelets about an in. long, on short, stout pedicels; glumes narrow, smooth or rough, the first sharp-pointed, about 1-3 in. long, 1-nerved or sometimes with a faint lateral pair, the second glume broader, obtuse, 3-nerved; lemmas about 1-2 in. long, narrow, rough or rough-hairy over the back, the awns about 1-4 in. long. Known also as Orcutt's brome-grass and Pacific brome-grass.

HABITAT: Chiefly on rather dry, open foothills and mountain sides and in dry, coniferous forests.

FLOWERING PERIOD: July and Aug.

SEED DISSEMINATION: Aug. and Sept.

FORAGE VALUE: Owing to its rank growth this plant is better suited to the grazing of cattle and horses than to sheep, though the latter eat the short basal leaves rather closely in the forepart of the season. Generally considered, however, it does not have high rank as a forage plant.

Bromus orcuttianus grandis Shear. See *B. grandis* (Shear) Hitchc.

Bromus polyanthus Scribn.

Many-flowered brome-grass

RANGE: Centr. Wash. and w. Mont., southw. and eastw. to centr. Ariz. and s. N. Mex.

DESCRIPTION: A rather deep-rooted, short-lived, stout perennial with creeping rootstocks; erect, smooth stems 2 to 3 ft. high; sheaths smooth or slightly fine-hairy. Panicle elongated, erect, the branches usually short and erect or slightly spreading; spikelets rather dense, 7 to 11-flowered, hence the specific and common name of this plant; glumes broad, smooth or somewhat rough, the lower 3-nerved and the upper 5 to 7-nerved; lemma 7-nerved, with a broad, thin and translucent margin; awns rather conspicuous, from 1-5 to 3-10 in. long.

HABITAT: A species tolerant to shade and most commonly met with in timbered, mountain areas of varying tree density; occasionally on glades; from about 6,000 to 8,500 ft. elevations.

FLOWERING PERIOD: June to Aug.

SEED DISSEMINATION: Aug. and Sept.

REPRODUCTION: New plants arise from the creeping root-stocks as well as from seed.

FORAGE VALUE: The plant is not as leafy as many of the brome-grasses, and, while relished by all classes of stock, it never occurs in such abundance as to give character to the landscape, and does not contribute largely to the range forage in any one locality. Its forage value is probably in proportion to its abundance.

Bromus porteri (Coult.) Nash

Nodding brome-grass

B. kalmii porteri Coulter

RANGE: Alb. to Man. and southw. to Ariz. and N. Mex.

DESCRIPTION: A tufted, short-lived, deeply-rooted perennial with rather slender, erect stems about 1 1-2 to 2 1-2 ft. high, hairy below the nodes; sheaths hairy or smooth; leaf-blades rather narrow and about 1-2 the length of the stem. Spikelets 4 to 8 in. long, the branches drooping when old; spikelets 5 to 10-flowered, on slender pedicels; lemmas blunt-pointed 5 to 7-nerved, densely hairy with long silky hairs and tipped with awns about 1-4 in. long. Also known as Porter's brome-grass. One of the commonest brome-grasses on N. F. ranges e. of the Pacific.

HABITAT: Open hillsides, meadows and in open forest, on sandy loam, clay and gravelly soils; medium elevations. Economically important chiefly throughout the Rocky Mts. between 3,500 and 6,000 ft.

FLOWERING PERIOD: July and Aug.

SEED DISSEMINATION: Aug. and Sept.

FORAGE VALUE: A forage plant of first rank for all classes of stock. A grass that the stockmen would like to have on the range in much greater abundance than it generally occurs.

Bromus porteri frondosus Shear

Weeping brome-grass

RANGE: N. Mex. and Ariz.

DESCRIPTION: A slender, weak, erect or ascending, somewhat tufted perennial, 1 1-2 to 2 1-2 ft. high. Differs from the species in its weak, leafy culms, rather narrower and less densely flowered spikelets, and smooth glumes. A rather newly described variety which may prove worthy of specific rank.

HABITAT: Rather dry, poorly disintegrated soils, the favorite habitat being among cliffs in canyons; at medium elevations.

FLOWERING PERIOD: June and July.

SEED DISSEMINATION: July to Sept.

FORAGE VALUE: Palatable to all classes of stock, but too limited in occurrence to be important as a forage plant.

Bromus porteri lanatipes Shear

Woolly-sheathed brome-grass

B. lanatipes (Shear) Rydb.

RANGE: From centr. Idaho and s. Mont. to s. Cal., Ariz. and N. Mex.

DESCRIPTION: A robust, erect perennial, variable in height, with stout, fibrous roots. Most striking character is the densely soft-downy or woolly leaf-sheaths, whence the common name. Leaves rough on both sides, larger than in the species from which it differs also in its larger and denser panicles, somewhat larger spikelets, smoother glumes and hairy to woolly leaf-sheaths.

HABITAT: Usually medium elevations, in waste places and dry to medium moist hillsides, in both fine and poorly disintegrated soils.

FLOWERING PERIOD: May to Aug., depending on locality.

SEED MATURITY: July to Oct., depending on locality.

FORAGE VALUE: Of value as forage to all classes of stock, but best adapted to horses and cattle because of the robust growth.

Bromus pumpellianus Scribn.

Pumpelly's brome-grass

RANGE: From s. N. Mex. and centr. Ariz. to S. Dak. and n. to w. Alaska.

DESCRIPTION: A stout, erect perennial, 1 1-2 to 3 ft. high, with creeping root-stocks. Culms smooth or hairy at the nodes. Sheaths smooth or sparsely downy-

hairy; leaf-blades broad, mostly smooth below and rough or somewhat hairy above, frequently inwardly inrolled when dry. Panicle erect, narrow; spikelets 7 to 11-flowered; glumes smooth; the lower 1-nerved, the upper 3-nerved; lemmas 5 to 7-nerved, densely and coarsely hairy on the margin nearly or quite to the top and across the back at the base; awn about 1-4 in. long.

Closely related to *B. inermis*, from which it differs essentially in having hairy or rough sheaths and leaf-blades.

HABITAT: On a variety of soil types of average moisture conditions. Common throughout the Rocky Mts. between 6,000 and 10,000 ft.

FLOWERING PERIOD: June to Aug.

SEED DISSEMINATION: Aug. and Sept.

FORAGE VALUE: A grass much relished by all classes of stock. Owing to its abundance and wide distribution it is among the most valuable of brome-grasses.

***Bromus purgans* L.**

Canadian brome-grass

B. ciliatus purgans (L.) Gray

RANGE: N. E. to Fla., and w. to n. w. Wyo., and Tex. Originally known from Canada.

DESCRIPTION: A rather stout perennial, 1 1-2 to 2 1-2 ft. tall; culms smooth or hairy at the nodes; leaf-blades broad, smooth or slightly rough to the touch on both sides. Panicle large, nodding; spikelets 7 to 11-flowered; awns straight, slender, about 1-5 in. long.

HABITAT: Waste places, foothill ranges, and moist, rocky woodlands.

FLOWERING PERIOD: May to July.

SEED DISSEMINATION: July and Aug.

FORAGE VALUE: Too sparse in stand to be of importance as a range plant.

***Bromus purgans pallidus* Hook.** See *B. richardsoni pallidus* (Hook.) Shear.

***Bromus purgans vulgaris* Hook.** See *B. vulgaris* (Hook.) Shear.

***Bromus racemosus commutatus* (Schrad.) Hook. f.** See *B. commutatus* Schrad.

***Bromus richardsoni* Link**

Richardson's brome-grass

RANGE: From. Brit. Col. to n. e. Oreg., Ariz., N. Mex., centr. Nebr. and Sask.

DESCRIPTION: A tufted, erect, robust perennial, 1 1-2 to 3 ft. tall; stems smooth; sheaths smooth or hairy; panicles nodding; spikelets drooping, 6 to 11-flowered; glumes smooth, the lower 1-nerved, the upper 3 or rarely 5-nerved; lemmas 7-nerved, often about twice the length of the glumes, appressed-hairy from the second nerve to the margin and also across the base; the awns 1-8 to 1-5 in. long. Sometimes called Drooping brome-grass.

HABITAT: Common along creeks, among willows and in moist park areas. Occasionally seen on medium dry soils. Common throughout the Rocky Mts. between 5,000 and 11,000 ft.

FLOWERING PERIOD: June to Aug.

SEED DISSEMINATION: Aug. and Sept.

FORAGE VALUE: While usually occurring sparingly and rarely in very dense stand, the palatability is high to all classes of stock, so that it furnishes a good deal of range forage. Sheep are particularly fond of the flower and seed heads, which no doubt are very nutritious.

***Bromus richardsoni pallidus* (Hook.) Shear**

Silky-flowered brome-grass

B. purgans pallidus Hooker

RANGE: W. Nebr., Colo., and Nev. and n. to the Arctic coast.

DESCRIPTION: Resembles the species and *B. ciliatus*, but it is distinguished by having spikelets intermediate in size between them. Further distinguished from the latter by its denser panicle, fewer, narrower, smoother leaves, and longer, silky pubescence of the lemma. It sometimes resembles *B. porteri* in everything but the distribution and character of the hairs of the lemmas.

HABITAT: About the same as for the species.

FLOWERING PERIOD: June to Aug.

SEED DISSEMINATION: Aug. and Sept.

FORAGE VALUE: Good forage for all classes of stock, but usually so limited in abundance as not to be of high economic value.

Bromus rubens L.

Red brome-grass

RANGE: A native of the region contiguous to the Mediterranean Sea and from there introduced to the Pacific coast in Cal. and Oreg.; found occasionally also on the Atlantic coast in N. E.

DESCRIPTION: A rather slender, tufted annual, 8 to 20 in. high; leaf-blades about 2 to 6 in. long and rather slender. The most conspicuous feature is the panicles, which are erect, compact, about 1 3-4 to 3 in. long, usually of a reddish purple color, with long, usually straight awns. Also known as Foxtail.

HABITAT: Dry hillsides and open lands of medium elevation.

FLOWERING PERIOD: Apr. to June.

SEED DISSEMINATION: May to July.

REPRODUCTION: Exclusively from seed. Germination power of the seed crop is usually high.

FORAGE VALUE: This plant is commonly associated with alfalfa (*Erodium cicutarium*) though considerably more drought resistant. Its only value as forage is very early in the season before the flower stalks are produced or after the seeds have been disseminated when, although not palatable, it is eaten because no other feed is available. Analyses show that it is low in nutrients. Its numerous, long awns are injurious to stock. On the whole, this plant is to be regarded as a pest and its replacement by other forage is most desirable.

Bromus secalinus L.

Cheat

RANGE: A native of Europe, now introduced into probably every State of the Union.

DESCRIPTION: An erect, annual grass 1 to 2 ft. high, with smooth leaf-sheaths; leaves smooth, coarse, sparsely hairy on the upper surface; panicle pyramidal in shape when the seed approaches maturity; awns 1-8 to 3-16 in. long. Known also as Chess.

HABITAT: A pestiferous weed in grain fields and waste places at medium elevations.

FLOWERING PERIOD: May to July.

SEED DISSEMINATION: June to Aug.

REPRODUCTION: Being an annual, new plants, of course, arise from seed. The seed crop usually has a large percentage of fertile seeds.

FORAGE VALUE: Where it occurs in sufficient quantity on the range it becomes of medium importance as forage. It is not equal, however, to many other brome-grasses in palatability.

Bromus subvelutinus Shear

Narrow-leaved brome-grass

RANGE: A comparatively newly described species whose range is not yet well defined. Known to occur in n. Ariz., Nev., Cal., Oreg., and Mont.

DESCRIPTION: An erect, tufted perennial, 10 to 20 in. high. Sheaths of the leaves studded with fine gray hairs; blades narrow with the edges rolled inwardly. Spikelets much flattened and provided with conspicuous awns. A very characteristic feature of this species is the large number of empty leaf-sheaths found at the base of the plant.

HABITAT: Dry wooded hills and meadows.

FLOWERING PERIOD: June to Aug.

SEED DISSEMINATION: July to Sept.

FORAGE VALUE: The forage value on the range generally is in proportion to its abundance. It is relished by all classes of stock.

Bromus suksdorfii Vasey

Suksdorf's brome-grass

RANGE: From Wash. to Cal.

DESCRIPTION: A tufted, fibrous-rooted, erect, leafy perennial from 2 to 3 ft. high; sheaths smooth; leaf-blades 5 to 6 in number, firm and smooth.

HABITAT: Rocky woods and mountain slopes, at medium to high elevations; rather tolerant to shade.

FLOWERING PERIOD: No data available.

SEED DISSEMINATION: No data available.

FORAGE VALUE: While this plant is grazed with relish by all classes of stock, it occurs so sparsely as to be of little value on the range.

Bromus tectorum L.

Downy brome-grass

RANGE: A native of Europe, now found in practically every State of the Union; not known, however, to occur in Cal., except in the variety *B. tectorum nudus*.

DESCRIPTION: A rather slender, erect annual, 6 in. to 2 ft. high, with large, open, drooping, bearded panicle. Leaves, including the sheaths, covered with a fine down; blades about 2 to 4 in. long; spikelets, for the most part, nodding, on slender stalks, at first contracted, later expanding to wedge-shape.

HABITAT: Fields, waste places and dry, sterile soils. Between 5,000 and 6,000 ft in Colo. (fid. Rydberg).

FLOWERING PERIOD: May to July.

SEED DISSEMINATION: July to Sept.

FORAGE VALUE: The large panicle, forbidding to stock, appears very early in the season and as the leafage, in addition, is scanty this is one of the poorest of all the brome-grasses as forage. A pestiferous weed in grain-fields and other cultivated grounds.

Bromus tectorum nudus Klett & Richter

Smooth downy brome-grass

RANGE: A native of Europe, widely distributed throughout the U. S.

DESCRIPTION: A variety closely resembling the species but distinguished from it chiefly by the glumes, which are smooth or very nearly so, instead of hairy, as in the species.

HABITAT: Along road-sides and in waste places in dry, often coarse soils.

FLOWERING PERIOD: May and June.

SEED DISSEMINATION: July and Aug.

FORAGE VALUE: Furnishes a small amount of forage before the troublesome heads are developed.

Bromus trinii Desv.

Trinius' brome-grass

RANGE: Cal. to Colo. and s. to Chile.

DESCRIPTION: An erect annual, culms smooth; panicle narrow and somewhat crowded; awns about 1-2 in. long, twisted below and bent below the middle.

HABITAT: On dry plains and rocky hillsides.

FLOWERING PERIOD: May to Aug.

SEED DISSEMINATION: July to Sept.

FORAGE VALUE: It is grazed with relish by cattle and horses while succulent and tender, but is too coarse to be relished by sheep.

Bromus unioloides (Willd.) H. B. K.

Rescue-grass

RANGE: A native of S. Am., probably in the Andes Mt. region from Chile northw.; perhaps also native to s. w. U. S., this, however, being a matter under dispute. Quite extensively cultivated and now found from Ga., Fla., and Ala. to Okla., Tex., N. Mex., and Ariz. and in Cal. from San Francisco southw. Also in Mex.

DESCRIPTION: A strong, rapid growing annual, sometimes becoming perennial, producing a large amount of leafage, and attaining a height of 1 to 3 ft. The large, open, spreading panicle gives the grass, when mature, quite an ornamental appearance. The species is characterized by its large, strongly flattened or compressed spikelets, short-awned lemmas, hairy leaf-sheaths and rough leaves. Known also as Schrader's brome-grass.

HABITAT: Cultivated fields (it is often grown for hay) and waste places, along irrigation ditches and in meadows. It requires a rich, moist, light soil for good development.

FLOWERING PERIOD: June to Aug.

SEED DISSEMINATION: July and Aug.

FORAGE VALUE: Of high value as a range and hay grass; relished by all classes of stock. This grass has proven of special value for winter pasturage in the Southern States. It is naturally an annual, but, if prevented by cutting or grazing from producing seed, it will survive several years and produce well. In Tex. "it makes more forage in Feb. and Mar. than any other grass tried. When cut for hay in Apr. it produced about 2 tons per acre." Its nutritive value is high and it is richer in protein and ether extract (fats) than rye or oat fodder.

Bromus villosus Forsk.

Hairy brome-grass

RANGE: A native of Arabia, Egypt and the Mediterranean Sea region; introduced into Cal., where it is infrequent northw., but common from San Francisco southw.

DESCRIPTION: A somewhat coarse, tufted annual, reaching a height of about 2 to 3 ft. Leaves long, broad and hairy; panicle half nodding; stalks of the spikelets long and slender; spikelets flattened, rather loose, bearing straight awns 1 or 2 in. long. Also called Arabian brome and ripgut-grass.

HABITAT: A weed in open ground, cultivated fields and waste places of medium elevations.

FLOWERING PERIOD: June and July.

SEED DISSEMINATION: July and Aug.

FORAGE VALUE: This plant does not rank with the best of the brome-grasses as forage. It is, however, eaten with safety and more or less relish before the flower stalks are produced. The awns of the spikelets are dangerous to stock, as they are apt to cause "big jaw," blindness, or other mechanical injury.

Bromus villosus gussonei Aschers. & Graebn.

Gussone's brome-grass

RANGE: Wash. to Cal. and Ariz., introduced from southern Europe. In Cal. of limited occurrence in the s., but more common than the species in the middle and n. parts of the State.

DESCRIPTION: Differs from the species in having a more open panicle, the lower branches as much as 4 or 5 in. long.

HABITAT: Open hillsides and waste places of medium elevations.

FLOWERING PERIOD: June to Aug.

SEED DISSEMINATION: July to Sept.

FORAGE VALUE: While not of as high forage value as some of the brome-grasses, it is grazed by all classes of stock. It furnishes a fair amount of forage of average quality.

Bromus vulgaris (Hook.) Shear

Hairy-sheathed brome-grass

B. purgans vulgaris Hooker

RANGE: Commonly met with from Cal. to Vancouver Island and Mont.

DESCRIPTION: A rather coarse perennial; stems 3 to 4 ft. tall; nodes, sheaths and leaves hairy; panicle 4 to 6 in. long, the branches slender and drooping; awns about 1-3 in. long.

HABITAT: Rocky woods and shady ravines and canyons, from medium elevations to 7,000 feet.

FLOWERING PERIOD: June and July.

SEED DISSEMINATION: July to Sept.

FORAGE VALUE: Good forage for all classes of stock while green; not relished after seed maturity so far as observations have been made.

Buchloe dactyloides (Nutt.) Engelm. See *Bulbilis dactyloides* (Nutt.) Raf.**BULBILIS**

The genus *Bulbilis* is represented by a single species. It is a member of the *Chlorideae*, Gramina tribe of the Grass family.

It is characterized by: Spikelets of one sex, with stamens (male) and pistils (female) in separate flowers on the same plant or on separate plants; staminate spikelets 2 or 3-flowered, stalkless in 2 rows along the short 1-sided spikes; pistillate spikelets 1-flowered in a cluster of 1-sided spikes which barely extend from the broad sheaths of the upper leaves.

Bulbilis dactyloides (Nutt.) Raf.

Buffalo grass

Buchloe dactyloides (Nutt.) Engelm.

RANGE: From Sask. and Minn. to Ark., Tex., s. Mex., e. N. Mex. and Wyo.

DESCRIPTION: A creeping or stoloniferous perennial with the stems bearing staminate flowers, 4 to 12 in. tall, erect, slender and smooth, those bearing pistillate flowers 1-2 to 3 in. long and much exceeded by leaves. Leaves flat, 1-12 in. wide or less, those of the staminate stems 1 to 4 in. long, erect, those of the stolons and pistillate stems 1 in. long or less, spreading. Staminate spikes 2 or 3, 1-4 to 1-2 in. long; the cluster of pistillate spikelets egg shaped and about 1-4 in. long.

HABITAT: Plains, prairies, river bottoms and along irrigation ditches.

FLOWERING PERIOD: Mar. to Aug.

SEED DISSEMINATION: May to Sept.

REPRODUCTION: The seedlings have both the staminate and pistillate flowers, but the staminate and pistillate branches propagate only their own kind.

FORAGE VALUE: Very palatable and greatly relished by all classes of stock at all stages of growth. As a winter forage it is without an equal. It often covers large areas with a close mat of fine-leaved herbage. Its habit of spreading by runners makes it resistant to both grazing and drought. It is one of the most valuable grasses of the Plains region of the West.

CALAMAGROSTIS

The reed-grasses, as the species of *Calamagrostis* are usually called, are usually tall reed-like perennials from running rootstocks, belonging to *Agrostideae*, the Redtop-Timothy tribe of grasses. The members of the genus *Calamagrostis* are very difficult of separation due to their great variation and to the existence of series of integrading forms between many of the species. The panicles are open or narrow; the spikelets 1-flowered, with the rachilla produced above the floret into a short, usually hairy pedicel or bristle; the glumes nearly equal, awnless; the lemma usually more delicate in texture than the glumes, surrounded at the base with callus hairs, and awned on the back usually from below the middle.

Calamagrostis may be distinguished from *Agrostis*, its closest relative, by its large spikelets, thicker stems, and especially by the tuft of callus hairs at the base of the lemma.

As forage plants the members of this genus are generally only very palatable in the spring and become tough and fibrous later in the season. They are generally not abundant on large areas except in the Northwest. There are about 150 species widely distributed over the world in cold and temperate regions. They vary in habitat from wet and acid soils to saline and dry situations.

Calamagrostis aleutica Bong.

Aleutian reed-grass

RANGE: Aleutian Islands to s. e. Alaska and along the Pacific coast to centr. Cal.

DESCRIPTION: Stems stout, densely tufted, erect, 2 to 5 ft. high. Leaves erect, rather stiff, 1 ft. or more long and about 1-3 in. or more wide, rough; stem leaves flat, gradually narrowed into a long inrolled point. Panicle narrow, rather loose, 6 to 12 in. long, the branches rather stiff, ascending; glumes 1-5 to 1-4 in. long, strongly keeled; lemma 1-6 in. long with callus hairs 1-2 as long; awn rather stout, attached below the middle, slightly bent and extending to the end of the lemma.

HABITAT: In bogs, swampy and marshy or sometimes rocky places near the coast.

FLOWERING PERIOD: June to Sept.

SEED DISSEMINATION: Aug. to Oct.

FORAGE VALUE: More data needed.

Calamagrostis breweri Thurb.

Brewer's reed-grass

RANGE: E. Cal.

DESCRIPTION: Stems slender, erect, densely tufted, 6 to 15 in. high. Leaves mostly basal, two on each stem, basal leaves 2 to 3 in. long, inrolled, bristle-like, slightly roughened above. Panicle loose, purple, 1 to 3 in. long, the lower branches slender, spreading, 1-2 to 1 in. long and bearing from 1 to 3 spikelets; glumes 1-8 to 1-6 in. long; lemma as long as the glumes, awn from near the base, bent, but extending beyond the glumes.

HABITAT: Mountain meadows between about 7,000 and 13,000 feet.

FLOWERING PERIOD: July and Aug.

SEED DISSEMINATION: Aug. and Sept.

FORAGE VALUE: Very palatable to all classes of stock. It is one of the best forage plants of the higher Cal. range; with *Carex filifolia* it makes up the highly valued so-called "Shorthair" ranges of the high Sierras. It occupies slightly moister situations and stays palatable longer than *Carex filifolia* and since it withstands grazing admirably it is of high value.

Calamagrostis californica Kearn.

California reed-grass

RANGE: E. Cal. A rare and little known species.

DESCRIPTION: Stems slender, straight, erect but not rigid, 2 1-2 to 3 1-2 ft. tall. Leaves flat or slightly inrolled, firm, about 8 to 16 in. long and 1-6 in. wide. Panicle narrow, loose, about 8 in. long, the branches slender, ascending, rather densely flowered; glumes 1-8 to 1-6 in. long, rough; lemma shorter than the glumes, strongly nerved, callus hairs abundant, 1-2 as long as the lemma, the awn attached below the middle, delicate, straight and extending only to the top of the lemma.

HABITAT: In the mts.

FLOWERING PERIOD: More data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: Nothing is known of this species as a forage plant, probably too rare to be of any importance.

Calamagrostis canadensis (Michx.) Beauv.

Bluejoint

RANGE: From Lab. to the upper Yukon in Alaska, s. to e. Cal., N. Mex. and N. C.

DESCRIPTION: Stems clustered, 2 to 5 ft. high. Leaves flat, rough, 6 to 16 in. long and 1-6 to 1-3 in. wide. Panicle open, the branches spreading or ascending; glumes 1-8 to 1-7 in. long; lemma nearly as long as the glumes, the callus hairs abundant and about as long as the ragged, tipped lemma; the awn inconspicuous, delicate, straight, attached just below the middle of the lemma and extending to or just beyond its tip. Known sometimes as Canadian reed-grass.

HABITAT: In wet meadows, along streams and in open woods. It is rather drought resistant for a plant of a wet habitat.

FLOWERING PERIOD: June to Sept.

SEED DISSEMINATION: Aug. to Oct.

REPRODUCTION: Produces a good deal of seed of high viability.

FORAGE VALUE: Of medium or less than medium value for any class of stock but better suited to cattle and horses than to sheep. It is widely distributed and often very abundant, occasionally covering considerable areas to the exclusion of other grasses and, under such conditions, yields a large amount of hay.

Calamagrostis canadensis acuminata Vasey

Mountain bluejoint

RANGE: From Lab. to centr. e. Alaska, Oreg., N. Mex. and N. C.

DESCRIPTION: This variety represents a transition from *C. canadensis* to *C. langsдорфii*. It differs from the former by having the panicle commonly rather small, more flexuous, more densely flowered and usually darker purple; spikelets larger 1-6 to 1-5 in. long and the glumes exceeding the pointed lemma; the awn less delicate and longer. From *C. langsдорфii* it can be distinguished only by its smaller spikelets, usually shorter and more delicate awn and less roughened glumes.

HABITAT: Wet sandy or gravelly valleys, meadows or open woods up to 11,000 ft. in Colo.

FLOWERING PERIOD: July and Aug.

SEED DISSEMINATION: Sept.

FORAGE VALUE: Good forage for cattle and horses but grazed only limitedly by sheep. It often forms a dense growth and produces a large amount of hay.

Calamagrostis densa Vasey

Dense reed-grass

C. vilfaeformis Kearn.

C. koelerioides Vasey

RANGE: N. Idaho, Oreg. and Cal.

DESCRIPTION: Stems in large bunches, 1 1-2 to 3 ft. high. Leaves with the sheaths smooth or rough, but no pubescence at the collar, the blades flat or becoming somewhat inrolled, 1-12 to 1-6 in. wide, and 2 to 12 in. long. Panicle narrow, dense, spike-like, more or less interrupted at the base and 2 to 4 in. long; glumes about 1-5 in. long; lemma about 1-8 to 1-6 in. long, slightly roughened, the callus hairs few, about 1-12 in. long, being usually more than half as long as the lemma; awn attached near the base of the lemma, bent, shorter than the glumes and extending out to one side. Known locally as Tufted pine grass.

HABITAT: Prairies and banks, rather dry to medium moist soils.

FLOWERING PERIOD: More data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: It is relished by all classes of stock and is the principal forage grass on the high elevations, around 7,000 ft., in the Trinity River country, Cal. It occurs in scattered bunches and does not form a continuous type.

Calamagrostis hyperborea Lange

Northern reed-grass

RANGE: From Greenl. to centr. Alaska and the Aleutian Islands, s. Cal., n. Ariz. and Pa.

DESCRIPTION: Stems densely tufted, rigid, stout, and 1 to 2 1-2 ft. high. Leaves loosely-inrolled, stiff, and very rough on both sides, 1-12 to 1-6 in. wide and 4 to 12 in. long. Panicle narrow, dense, more or less spike-like, 2 to 6 in. long; glumes 1-6 to 1-5 in. long, abrupt pointed, exceeding the roughened lemma; callus hairs 1-2 to 3-4 as long as the lemma; awn attached about the middle of the lemma, straight and about as long as the glumes.

HABITAT: In damp soil, moist meadows, and on calcareous cliffs. In Colo. to an elevation of 8,500 feet.

FLOWERING PERIOD: June to Aug.

SEED DISSEMINATION: Aug. and Sept.

FORAGE VALUE: Palatable to all classes of stock. Generally not very abundant though some times forms a considerable portion of the wild hay of which it makes a good quality if cut before it becomes too wiry.

Calamagrostis hyperborea americana (Vasey) Kearn.

American reed-grass

RANGE: From Hudson Bay to Brit. Col., Oreg., n. N. Mex. and Vt.

DESCRIPTION: Closely resembles the species, differs from it by having panicles more dense and spikelets shorter, 1-8 to 1-6 in. long. Known also as Yellow-top.

HABITAT: Most common along sandy banks of streams, ponds and lakes; seems to thrive better in alkaline soils than its relatives and is confined to relatively low altitudes.

FLOWERING PERIOD: More data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: Palatable to all classes of stock though of less value for sheep than for cattle and horses. Sometimes grows abundant enough to afford a large amount of excellent hay. A good grass for cultivation in moist sandy meadows,

Calamagrostis inexpansa Gray

Narrow-headed reed-grass

RANGE: N. Y. and N. J. to Mo., Colo., w. Wyo., and w. centr. Mont. The varieties *C. inexpansa cuprea* Kearn. and *C. inexpansa barbulata* Kearn. occur w. to the Cascade Mts.

DESCRIPTION: Stems solitary or few, slender, erect, not branched and 1 1-2 to 4 ft. high. Leaves rough above, flat, though often inrolled in drying, 6 to 12 in. long and 1-8 to 1-5 in. wide. Panicle pale, 3 to 8 in. long, moderately dense, with the branches erect; glumes 1-6 in. long, somewhat roughened, rather rigid, sharp-pointed, about 1-4 longer than the toothed lemma; callus hairs 1-4 to 1-3 shorter than the lemma and the awn scarcely exceeding the lemma. Known also as Bog reed-grass.

HABITAT: Swamps and low prairies, often damp sandy soil.

FLOWERING PERIOD: July to Sept.

SEED DISSEMINATION: Sept. and Oct.

FORAGE VALUE: Palatable to all classes of stock, though due to its rank growth it is best adapted to cattle and horses and is more readily grazed by them than by sheep. Generally not abundant though sometimes produces a fair crop of good hay.

Calamagrostis koelerioides Vasey. See *C. densa* Vasey.

Calamagrostis langsdorffii (Link) Trin.

Langsdorf's reed-grass

RANGE: From Greenl. to Alaska s. to N. C., Mich., N. Mex. and Oreg. Also in n. Europe and Asia.

DESCRIPTION: Stems stout, erect, unbranched and generally 2 to 4 ft. high though often 6 ft. high on Kodiak Island, Alaska. Leaves roughened, 4 to 12 in. long and 1-6 to 1-3 in. wide. Panicle 2 to 6 in. long, the branches ascending or erect; glumes 1-5 to 1-4 in. long, tapering at the end, strongly roughened, somewhat longer than the toothed lemma; awn stout and as long as the glumes. Closely related to *C. canadensis acuminata*; the differences given under that variety.

HABITAT: In meadows, wet rocky areas and open woods. In s. Alaska it grows on the open hillsides.

FLOWERING PERIOD: June to Sept.

SEED DISSEMINATION: Aug. and Sept.

FORAGE VALUE: Highly prized, especially for cattle and horses but generally not very abundant. In s. Alaska it is the most plentiful tall grass and because of its thin leaves and stems cures readily and makes a palatable hay.

Calamagrostis montanensis Scribn.

Montana reed-grass

RANGE: From S. Dak. and n. Wyo. to e. Wash., Alb. and Sask.

DESCRIPTION: Stems rather rigid, erect and 7 to 12 in. high. Leaves inrolled, bristle-like, rough, the basal 4 1-2 to 6 in. long, stem leaves shorter. Panicle narrow, dense and 2 to 2 1-2 in. long; glumes pointed, 1-6 in. long or more; lemma 1-8 in. long, rather thin, finely roughened, 4-toothed, callus hairs 1-3 length of lemma; awn stiff, straight, from the lower 1-3 of the lemma and about as long as the lemma.

HABITAT: On dry bench lands and sterile, sandy prairies and hillsides. In Wyo. at elevations of from about 5,000 to 8,000 ft.

FLOWERING PERIOD: July and Aug.

SEED DISSEMINATION: Aug. and Sept.

FORAGE VALUE: Palatable to all classes of stock, being especially relished in its younger stages. It is the only representative of this genus which is of much value as a pasture grass on the dry prairies and foothills. It cures well on the ground

and makes good winter pasturage. It is generally of rather local distribution but sometimes occurs abundantly.

Calamagrostis purpurascens R. Br.

Purple reed-grass

RANGE: From Greenl. to Arctic Alaska and s. to w. S. Dak., Colo. and Cal.

DESCRIPTION: Stems, from fibrous spreading and deep roots, tufted, erect and 1 1-2 to 2 1-2 ft. high. Leaves rough, 3 to 8 in. long, and 1-6 to 1-3 in. wide. Panicle dense, spike-like, 2 to 5 in. long, pale or sometimes purple; glumes 1-4 to 1-3 in. long, rough; lemma nearly as long as the glumes, 4-nerved, 4-awned at apex, the awn from the back of the lemma arising near the base, bent and extending about 1-12 in. beyond the glumes. Known also as Purple pine grass.

HABITAT: Its deep roots make it well adapted to dry situations and it is found on subalpine open ridges, dry rocky hills, and in dry woods to elevations of 12,500 ft.

FLOWERING PERIOD: July and Aug.

SEED DISSEMINATION: Aug. and Sept.

FORAGE VALUE: Grazed with relish by all classes of stock especially in the spring, but palatable for cattle and horses much later. Reported not grazed in District 2 because it nearly always occurs in lodgepole pine areas.

Calamagrostis rubescens Buckl.

Pine grass

C. suksdorfii Scribn.

RANGE: From Man. to Brit. Col., centr. Cal. and n. Colo.

DESCRIPTION: Stems tufted, smooth and 2 to 3 ft. tall. Leaves with sheaths smooth but pubescent on the collar, the blades about 6 in. long and from 1-12 to 1-6 in. wide. Panicle narrow, spike-like, pale or purple, 3 to 6 in. long; glumes 1-10 to 1-5 in. long, nearly smooth; lemma about as long as the glumes, smooth, the callus hairs about 1-3 as long; awn attached near the base of the lemma, bent, extending out at the sides of the glumes, the terminal portion about 1-24 of an in. in length.

HABITAT: Common in low pine woods or on moist mountain slopes; also on prairies and in meadows. It is very drought resistant and is able to grow on scablands and poorly disintegrated soils.

FLOWERING PERIOD: July and Aug.

SEED DISSEMINATION: Aug. and Sept.

REPRODUCTION: Produces quite a number of flower stalks but only a small amount of seed is matured. This seed is of high viability and consequently many seedlings can be found. However, it reproduces principally by its creeping rootstocks.

FORAGE VALUE: Grazed quite freely in the spring but later it becomes fibrous, tough and unpalatable and is only lightly grazed. In the fall it becomes somewhat softened and is grazed to some extent. It is generally very abundant in the Northwest, being the predominating grass on a number of Forests. Since it is propagated by rootstocks it can withstand early grazing very well and range where this species predominates should be used early so that the forage can be consumed when it is most palatable and kept from becoming rank.

Calamagrostis rubescens luxurians (Kearn.)

Luxuriant pine grass

C. suksdorfii luxurians Kearn.

RANGE: Brit. Col. to Oreg. and Idaho, and also in s. Wyo.

DESCRIPTION: Differs from the species by: Stems stout, 3 1-2 to 5 ft. high, usually of softer texture; leaves softer and less inrolled, sometimes flat; panicle

larger 4 to 8 in. long, and about 1 in. wide and often more loosely flowered; glumes about 1-5 in. long and the lemma 1-4 to 1-5 shorter than the shorter glume.

HABITAT: Open woods.

FLOWERING PERIOD: More data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: About the same as the species.

***Calamagrostis scribneri* Beal.**

Scribner's reed-grass

RANGE: From Brit. Col. to Alb., Colo. and Wash.

DESCRIPTION: Stems rather slender, erect and 1 1-2 to 3 ft. high. Leaves flat, rough, 8 to 12 in. long and 1-6 in. wide. Panicle 4 to 7 in. long, somewhat contracted, the branches erect, the longest 2 to 3 in. long; glumes about 1-6 in. long, rough; lemma 1-4 shorter than glumes, irregularly 4-toothed at apex; callus hairs 1-2 to 2-3 as long as lemma; awn straight, rather stout, arising from below the middle of the lemma and equaling the glumes.

HABITAT: Prefers wet meadows and marshes, but thrives on bottom lands and even among bushes and on lower slopes of hills.

FLOWERING PERIOD: Aug.

SEED DISSEMINATION: Sept.

FORAGE VALUE: Palatable, especially in the first half of the season. It tends to become tough and fibrous later and is not grazed so much then. It often makes dense close growth that yields an abundance of good hay.

***Calamagrostis suksdorfii* Scribn.** See *C. rubescens* Buckl.

***Calamagrostis suksdorfii luxurians* Kearn.** See *C. rubescens luxurians* (Kearn.)

***Calamagrostis vilfaeformis* Kearn.** See *C. densa* Vasey.

CALAMOVILFA

Rather tall rigid perennials of the *Agrostideae*, the Redtop-Timothy tribe of grasses. There are about 5 species in the temperate and subtropical regions of North America. The genus *Calamovilfa* is characterized by: Stout horizontal root-stocks; loosely spreading panicles; 1-flowered, awnless spikelets; callus densely bearded; glumes rather firm, unequal, pointed, shorter than the floret; lemma 1-nerved, pointed; palea as long as the lemma; the grain permanently enclosed in the lemma and palea.

***Calamovilfa longifolia* (Hook.) Scribn.**

Sand-grass

RANGE: From w. Ont. to Man., e. Mont., and extreme n. e. N. Mex., Kans. and n. Ind.

DESCRIPTION: Stems solitary, erect, stout, smooth, 2 to 6 ft. high. Leaf-sheaths crowded and overlapping usually pubescent, at least on the margins, the blades 8 to 12 in. long or more, inrolled above and tapering into a long thread-like point. Panicle pale, 6 to 18 in. long, narrow, the slender smooth branches erect or ascending; spikelets about 1-5 to 1-3 in. long; callus hairs more than half the length of the smooth lemma and palea.

HABITAT: Sandy and dry sterile soil at elevations up to about 5,000 feet.

FLOWERING PERIOD: June to Aug.

SEED DISSEMINATION: July to Sept.

FORAGE VALUE: Of medium or less than medium palatability but sometimes of value in dry sandy swales and on sandy hillsides where better grasses are scarce.

It produces a good deal of coarse and fibrous forage which becomes self-cured and during the dry season is as good as hay, making it of considerable importance as cattle feed in many localities. It is often plentiful and in parts of the Plains is cut for hay. It is an excellent grass for binding drifting sands and may prove valuable for paper making.

CAPRIOLA

Perennial grasses of the *Chlorideae*, the Grama tribe. There are about 4 known species, three are Australian and the following widely distributed. The genus *Capriola* is made up of low perennials with creeping rhizomes or stolons and slender one-sided spikes, all arising together at the end of the stem; the spikelets 1-flowered, flattened, awnless, sessile in 2 rows along one side of a slender, flat, continuous rachis; glumes unequal, narrow, acute and keeled; rachilla prolonged behind the floret as a blunt pedicel; lemma broad, boat shaped.

Capriola dactylon (L.) Kuntze

Bermuda grass

Cynodon dactylon (L.) Pers.

RANGE: A native of the warmer parts of Europe. Now naturalized throughout the warmer parts of the world. In N. Am. from Mass. and s. N. Y. to Fla., Mo., N. Mex. and Ariz. and on the Pacific slope from Wash. to Cal., s. through Mex. into S. Am. Also in the West Indies.

DESCRIPTION: Stems flattened, wiry, smooth, erect, 4 to 12 in. tall or on good soils up to 2 ft. in height. Leaves 1 to 2 in. long, 1-12 to 1-6 in. wide, flat, rigid, smooth beneath, rough above. Spikes 4 or 5 in number, 1-2 to 2 in. long.

HABITAT: Fields and waste places. Grows freely on poor or sandy soil where other grasses will not thrive and resists extreme drought and high temperature.

FLOWERING PERIOD: Apr. to Oct.

SEED DISSEMINATION: June to Nov.

FORAGE VALUE: Very palatable, all classes of stock being fond of it. It is one of the most valuable grasses for the South, and is extensively cultivated there and in the warmer parts of the Southwest and Pacific slope. It may be cut 3 or 4 times during the season and yields, under good conditions, 3 or 4 tons to the acre and as high as 10 tons have been produced under extra favorable conditions. It is used extensively as a lawn grass and for binding sands. When once established it resists grazing and trampling remarkably well. It is highly nutritious and contains more protein than most of the cultivated grasses.

CATABROSA

A genus composed of a single species. It is a member of the *Festuceae*, Fescue-Bluegrass-Brome tribe of grasses. It is characterized as follows: Spikelets usually 2-flowered; glumes unequal, shorter than the lemmas; lemmas slightly leathery, strongly 3-nerved and awnless; both the glumes and lemmas ragged at the broad summit.

Catabrosa aquatica (L.) Beauv.

Water whorl-grass

RANGE: From Lab. to s. e. Alaska, Idaho, e. Nev., Colo. and Nebr. Also in Europe and Asia.

DESCRIPTION: A smooth, soft, perennial with creeping or ascending stems 4 to 24 in. high, the decumbent stems rooting at the lower nodes. Leaf-sheaths loose, overlapping; the blades flat, soft, 1 to 5 in. long and 1-12 to 1-4 in. wide. Panicle open, 1 to 8 in. long, the spreading or ascending branches in whorls, 1-2 to 2 in. long; spikelets 1-10 to 1-6 in. long.

HABITAT: In water or wet soil to elevations of about 9,500 ft. in Colo. and Utah.

FLOWERING PERIOD: June to Aug.

SEED DISSEMINATION: July to Sept.

FORAGE VALUE: Grazed by cattle and horses but very seldom by sheep. Owing to the low stature and its limited distribution and abundance, as a result of its restriction to wet soils, it is not important as forage.

CENCHRUS

Annual or perennial grasses of the *Paniceae*, Millet tribe. There are about 20 species in tropical and temperate regions. They are characterized by 1-flowered spikelets, 2 to 6 together, subtended and nearly enclosed by a short-stalked egg-shaped or globular involucre of rigid united spines, which falls off with them at maturity; glumes shorter than the lemmas; the sterile lemma with a thin transparent palea; the fertile lemma and palea slightly hardened.

Cenchrus carolinianus Walt.

Sand-bur

C. tribuloides, of most American authors, not L.

RANGE: Me. to Minn., e. Colo., N. Mex. and Fla. and through Mex. to centr. Am. Also in the West Indies.

DESCRIPTION: An annual with flattened, much branched, ascending or spreading stems 1 to 2 1-2 ft. long. Leaves flat, 2 1-2 to 5 in. long, 1-6 to 1-3 in. wide. Raceme 1 to 3 in. long, with 6 to 20 involucre about 1-3 in. thick, pubescent with short hairs, the spines spreading or reflexed 1-8 to 1-6 in. long; spikelets 2 or 3.

HABITAT: Dry sandy places, cultivated fields, and on river banks.

FLOWERING PERIOD: May to Aug.

SEED DISSEMINATION: June to Sept.

REPRODUCTION: It produces an abundance of seed which is very easily disseminated in the fur of animals.

FORAGE VALUE: Very palatable and nutritious to all classes of stock. It starts growth early in the spring and produces an abundance of leafy forage which is readily grazed until the burs are ripe and again after they have dropped. It remains green under adverse conditions when other grasses dry up. In some parts of the Southwest it assumes considerable importance as a forage plant in the spring and early summer. Generally, however, it occurs as a troublesome weed in cultivated fields and it is probable that its objectionable qualities as a weed outweigh its value for early spring feed.

CHAETECHLOA

Chaetochloa is a member of *Paniceae*, the Millet tribe of grasses. There are about 40 species in temperate and tropical regions of both hemispheres. The genus *Chaetochloa* is made up of annual or perennial grasses with erect stems, flat leaves, and dense cylindrical or somewhat open, bristly panicles; spikelets usually 1-flowered and a staminate (male) or sterile flower below; subtended by either a single or a cluster of bristles arising from the rachis below the joint of the spikelets.

The species of *Chaetochloa* are generally palatable and nutritious and several of them are cultivated, especially in the Eastern states. On National Forest ranges they seldom occur abundantly.

Chaetochloa composita (H. B. K.) Scribn.

Composite foxtail-millet

Setaria composita H. B. K.

RANGE: From Tex. to Colo. and Ariz. and s. to S. Am.

DESCRIPTION: A pale, smooth, tufted perennial much branched from the base with rough and often pubescent stems, 12 to 40 in. high, the nodes bearded with a ring of silky hairs. Leaves 4 to 10 in. long, 1-12 to 1-5 in. wide, rough, usually folded. Panicle cylindrical, dense, somewhat spike-like, 2 to 6 in. long and 1-4 to 3-5 in. in diameter; branches short, densely flowered; bristles single, rarely in pairs, green, flexuous, 1-5 to 3-5 in. long, barbed backwards.

HABITAT: Dry soil.

FLOWERING PERIOD: June to Oct.

SEED DISSEMINATION: July to Nov.

FORAGE VALUE: Palatable to all classes of stock and quite common so that it is rather important.

***Chaetochloa glauca* (L.) Scribn.**

Yellow foxtail-millet

Setaria glauca (L.) Beauv.

RANGE: A native of Europe. Now naturalized in N. Am. from Vt. to Man., e. Colo., N. Mex. and Fla. Also in Cal. and s. w. Oreg.

DESCRIPTION: An erect or ascending, somewhat tufted, whitish annual 1 to 4 ft. high, the stems branching at the base, bent, flattened and smooth. Sheaths smooth, blades 2 to 6 in. long, 1-6 to 1-3 in. wide, long pointed. Panicle dense 1 to 4 in. long; bristles 5 to 12 at each spikelet, 1-6 to 1-3 in. long, tawny-yellow.

HABITAT: Waste places and cultivated fields. Often a troublesome weed.

FLOWERING PERIOD: June to Aug.

SEED DISSEMINATION: July to Sept.

FORAGE VALUE: Palatable to all classes of stock and often occurring in sufficient abundance to be of some importance.

***Chaetochloa grisebachii* (Fourn.) Scribn.**

Grisebach's foxtail-millet

Setaria grisebachii Fourn.

RANGE: Tex. to Ariz. and Mex.

DESCRIPTION: A smooth, slender, tufted annual 6 to 32 in. high with very slender stems branching at the base, smooth with the nodes bearded with short hairs. Sheaths rough; blades 2 to 5 in. long, 1-5 to 2-5 in. wide, rough and sparingly short, pubescent. Panicle rather compact, the branches short, appressed, few-flowered, the lower far apart; bristles single or in pairs, somewhat flexuous, purple or sometimes green 1-5 to 3-5 in. long.

HABITAT: Varies from moist places along creek bottoms to dry, rocky or sterile soils to elevations of about 6,000 ft. in Ariz.

FLOWERING PERIOD: Aug. and Sept.

SEED DISSEMINATION: Sept. and Oct.

FORAGE VALUE: Palatable to all classes of stock but seldom very abundant. After frosts it is less palatable.

***Chaetochloa italica* (L.) Scribn.**

Italian foxtail-millet

Setaria italica (L.) Beauv.

RANGE: A native of Europe and Asia. Introduced in U. S. and widely escaped from cultivation from Que. to N. D. and southw. to Fla. and e. Ariz.; its American range appears to be slowly extending westw.

DESCRIPTION: A stout, erect, somewhat whitish annual with stems often branching at the base and varying in height from 1 1-2 to 5 ft. high, smooth or slightly rough below the nodes and panicle; the nodes bearded with short hairs. Leaves flat, 8 to 16 in. long, 3-5 to over 1 in. wide, narrowed at the base and

long-pointed. Panicle dense, cylindrical, 1 to 8 in. long, often 1 in. in diameter, sometimes interrupted near the base, the branches densely flowered; bristles 2 or 3 in a cluster 1-8 to 2-5 in. long and longer than the spikelets. Known also as Hungarian grass.

HABITAT: Requires rich land and is exhausting to the soil in cultivation. Escaped, it grows commonly in fields, along roadsides and in waste places.

FLOWERING PERIOD: July to Sept.

SEED DISSEMINATION: Aug. to Oct.

FORAGE VALUE: The stems, when mature, become hard, woody and unpalatable. The seeds are often injurious to stock because of the bristles. When grown for hay it should be cut just as soon as it begins to head; at that time it has produced a large amount of reasonably succulent and palatable forage. It is a useful soiling plant, often being used to precede clover and permanent pasture; for this purpose 2 or 3 pecks of seed per acre should be used; for seed 1 peck per acre is sufficient. In Europe the plant is widely grown for fodder and for fowl-seed. This grass has great historical interest as it is perhaps the oldest cultivated plant of which we have record. It is known to have been cultivated in China as early as 2700 B. C., in early Egypt, and its seeds are so abundant in the kitchen middens of the lake dwellings of the Stone Age in Switzerland that it must be regarded as the main bread supply of these prehistoric peoples. In parts of India and Trans-Caucasia, flour is still extensively made from the seed of this species.

***Chaetochloa verticillata* (L.) Scribn.**

Whorled foxtail-millet

Setaria verticillata (L.) Beauv.

RANGE: Native of Europe. Now widely distributed in N. Am. s. from N. S., Ont. and Nebr. and through n. e. Mex. to s. Mex. Also collected in s. e. Ariz.

DESCRIPTION: An erect or ascending, somewhat tufted annual with smooth stems 1 to 2 ft. high. Leaf-sheaths loose, smooth; blades flat, soft, rough, 3 to 7 in. long, 1-4 to 1-2 in. wide. Panicle spike-like, 2 to 3 in. long, the branches nearly whorled, short, densely flowered; bristles 1 to 3 at each spikelet, stout, flexuous, barbed backward to the very base, 1-8 to 1-4 in. long.

HABITAT: Commonly considered a weed; in waste places and cultivated fields.

FLOWERING PERIOD: June to Sept.

SEED DISSEMINATION: July to Oct.

FORAGE VALUE: Palatable to all classes of stock but not very common and the bristles are bothersome to stock and are liable to cause considerable injury. The forage should be utilized, when possible, before the seed stalks are produced.

***Chaetochloa viridis* (L.) Scribn.**

Green foxtail-millet

Setaria viridis (L.) Beauv.

RANGE: Native of Europe. Now naturalized throughout the U. S. and s. Can.

DESCRIPTION: An erect, tufted annual with smooth stems 1-2 to 3 ft. high. Leaves 2 to 10 in. long and 1-6 to 2-5 in. wide, long-pointed, slightly rough. Panicle linear, egg-shaped, tapering, 1 to 4 in. long; bristles slender, straight, barbed upward 2-5 to 3-5 in. long.

HABITAT: In waste places and cultivated fields.

FLOWERING PERIOD: June to Sept.

SEED DISSEMINATION: July to Oct.

FORAGE VALUE: Eaten readily by all classes of stock, but seldom abundant enough to be important.

CHLORIS

Chloris is a member of *Chlorideae*, the Grama tribe of grasses; being the genus from which the tribe is named. There are about 40 species in the warmer parts of the world, mostly perennials but a few annuals. They are characterized by flat leaves and one-sided spikes, arising from the ends of the stems; spikelets with 1 perfect flower, sessile in 2 rows on 1 side of a continuous rachis; glumes 2, unequal; rachilla prolonged behind the fertile floret, bearing 1 or more rudimentary, awned, sterile lemmas.

***Chloris elegans* H. B. K.**

Bearded crowfoot

RANGE: From Tex. to s. Cal. and Mex.

DESCRIPTION: An annual with erect or spreading stems 1 to 3 ft. high, smooth. Sheaths smooth, the uppermost often inflated around the base of the inflorescence. Leaves numerous, 1-2 to 8 in. long and 1-12 to 1-4 in. wide, smooth beneath and rough above. Spikes 6 to 12 in number, 1 to 3 in. long; lemmas with a slender straight awn, about 1-2 in. long.

HABITAT: Fields, waste places, dry mesas and desert hills.

FLOWERING PERIOD: May to Sept.

SEED DISSEMINATION: June to Nov.

FORAGE VALUE: Palatable to all classes of stock and usually furnishes an abundance of forage. It is important whenever it occurs in any quantity on the range.

***Chrysopogon nutans* (L.) Benth.** See *Sorghastrum nutans* (L.) Nash.

CINNA.

Cinna is a member of *Agrostideae*, the Redtop-Timothy tribe of grasses. It consists of 3 species which occur in the n. regions of Europe, Asia and America. They are tall grasses with flat leaves and nodding, rather loose panicles, 1-flowered spikelets, 2 unequal glumes, and with the rachilla prolonged behind the palea as a short smooth bristle.

***Cinna latifolia* (Trev.) Griseb.**

Wood reed-grass

RANGE: From Nfd. to Brit. Col., N. J. and Wash. and s. in the mts. to N. C., n. N. Mex., Utah and Cal. Also in n. Europe.

DESCRIPTION: Stems 2 to 4 ft. tall, erect, usually slender and smooth, 4 to 10 in. long, about 1-2 in. wide, rough. Panicle 5 to 12 in. long, the flexuous, slender branches spreading or drooping; glumes about equal, rough, 1-6 in. long; lemma about equaling the glumes, short awned.

HABITAT: Moist places in woods and along streams, generally at medium and high elevations. It needs a comparatively high amount of moisture.

FLOWERING PERIOD: July and Aug.

SEED DISSEMINATION: Aug. and Sept.

FORAGE VALUE: Ranks high in palatability for all classes of stock. It is seldom abundant enough to be important, but, where it is abundant it yields a large amount of excellent hay. It remains green and tender throughout the summer grazing period and the herbage is generally closely consumed. Sheep have a tendency to avoid moist or soggy lands and consequently this class of stock graze on this species for the most part in the latter part of the season.

***Cynodon dactylon* (L.) Pers.** See *Capriola dactylon* (L.) Kuntze.

DACTYLIS

A member of *Festuceae*, the Fescue-Bluegrass-Brome tribe of grasses. It consists of a single species.

Dactylis glomerata L.

Orchard grass

RANGE: Native of Europe and Asia. Now widely naturalized throughout the U. S., s. Can. and s. e. Alaska.

DESCRIPTION: A perennial bunchgrass with smooth, erect stems 2 to 4 ft. high. Leaves flat, rough, 3 to 9 in. long, 1-12 to 1-4 in. broad. Panicle 3 to 8 in. long, the few, stiff branches erect after flowering; spikelets 3 to 5-flowered, crowded in dense, 1-sided clusters at the ends of the panicle branches; lemmas awn pointed.

HABITAT: Will grow on a great variety of soils: requires moderate amount of fertility and moisture and will not grow on arid or wet soils.

FLOWERING PERIOD: May to July.

SEED DISSEMINATION: July to Sept.

FORAGE VALUE: Relished by all classes of stock. It produces an abundance of foliage, becomes green early and remains green throughout the season, withstands grazing well and yields an abundant crop of excellent hay. At present it is not abundant on the range, but it reproduces well and should be encouraged wherever it occurs.

DANTHONIA

The genus *Danthonia* is a member of *Aveneae*, the Oat tribe of grasses. There are about 100 species widely distributed in warm and temperate regions, chiefly in South Africa with only about 10 species in North America. They are tufted, erect annuals or perennials, the N. Am. species all perennial, with narrow leaves and small terminal panicles or racemes; spikelets several-flowered, the uppermost florets imperfect or rudimentary; glumes about equal, much longer than the lemmas and usually extending above the uppermost floret; lemmas convex, 2-toothed at apex with a twisted awn from between the teeth; awn flat, formed by the extension of the 3 middle nerves of the lemma.

While most of the species are palatable the foliage usually dries up fairly early and since they also seldom occur abundantly they do not as a genus have a high forage value.

Danthonia americana Scribn.

American oat-grass

Merathrepta americana (Scribn.) Piper

RANGE: From Brit. Col. to Wyo., Idaho and Cal. Also in Chile.

DESCRIPTION: Stems smooth, tending to break apart at the nodes, 1 to 2 ft. high. Leaf-sheaths hairy and long bearded at the throat; blades 1 to 3 in. long, and 1-24 to 1-12 in. wide. Panicle bearing 2 to 5 spikelets, the pedicels usually about 1-2 in. long, spreading or somewhat reflexed; glumes 1-2 to 3-4 in. long, smooth, pointed, about 7-nerved; lemmas about 1-5 to 1-3 in. long, smooth and convex on the back, hairy at base and margins, abruptly contracted into 2 teeth with awns 1-12 to 1-4 in. long; the awn from between these teeth, bent, flat, twisted below, straight and divergent above.

HABITAT: Wet meadows and moist places in rocks.

FLOWERING PERIOD: More data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: Palatable to all classes of stock, especially early in the season.

Danthonia californica Boland.

California oat-grass

Merathrepta californica (Boland.) Piper

RANGE: From Brit. Col. to Mont., Colo. and Cal.

DESCRIPTION: Stems smooth, 2 to 3 ft. tall. Sheaths smooth, or somewhat hairy at the throat; blades rough above, narrow, inrolled, 1 to 4 in. long, the upper leaves standing out almost at right angles to the stem. Panicle unbranched with 3 to 10 spikelets; spikelets broad 5 to 10-flowered on pedicels of their own length; glumes 3-5 to 1 in. long, 5 to 7-nerved; lemmas 9-nerved, broad, firm, shining, hairy near the margins, about 1-2 in. long to end of teeth which are about 1-16 in. long; awn about 2-5 in. long and twisted once around.

HABITAT: Varies from dry hills to wet meadows but usually in well drained park areas. In Colo. extends to an altitude of 10,000 feet.

FLOWERING PERIOD: May to July.

SEED DISSEMINATION: June to Aug.

FORAGE VALUE: Palatable to all classes of stock. It produces a large amount of fine, leafy foliage but as it occurs only scatteringly it is not very important.

Danthonia californica unispicata (Munro) Thurb. See *D. unispicata* Munro.**Danthonia compressa** Austin

Flattened oat-grass

RANGE: Me. to N. Y., s. to N. C. and Tenn. Also collected in the Black Hills of S. Dak.

DESCRIPTION: Stems flattened, often decumbent at base, slender, unbranched, smooth, 2-3 to 3 ft. high. Leaf-sheaths naked with silky hairs at the throat; basal leaves 6 to 12 in. long or longer, the upper 3 to 6 in. long, 1-12 to 1-8 in. wide, flat or inrolled only on the margins, rough. Panicle open 2 1-2 to 4 in. long, the lower branches usually spreading; spikelets 5 to 10-flowered; glumes 2-5 to 1-2 in. long; lemmas with a ring of short hairs at base, pubescent, the awn erect or somewhat bent, strongly twisted below, slightly so above, the teeth awned, at least 1-12 in. long.

HABITAT: In woods and mountain parks.

FLOWERING PERIOD: June to Aug.

SEED DISSEMINATION: July to Sept.

FORAGE VALUE: Very palatable and highly nutritious to all classes of stock. It furnishes an abundance of forage and withstands grazing and trampling well. It forms the bulk of the forage in the mountain parks of Tenn. and N. C.

Danthonia intermedia Vasey

Timber oat-grass

Merathrepta intermedia (Vasey) Piper

RANGE: Que., n. Mich., and from Sask. to Brit. Col. and s. in the mts. to N. Mex. and e. Cal.

DESCRIPTION: Stems 4 to 16 in. high with numerous, mostly inrolled, basal leaves; sheaths smooth; blades somewhat hairy 2 to 6 in. long. Panicle narrow, compact, often 1-sided, 1 to 2 in. long, the pedicels short and appressed; glumes about 1-2 in. long; lemmas 1-4 to 1-3 in. long, hairy at the base and on the margins below the middle, the teeth awned, the awn from between the teeth, flat, about 1-3 in. long.

HABITAT: Meadows, hillsides and mountain slopes. In Colo. at elevations of 9,000 to 11,500 ft.

FLOWERING PERIOD: July and Aug.

SEED DISSEMINATION: Aug. and Sept.

FORAGE VALUE: Palatable and nutritious, but dries up early in the year and also does not occur abundantly.

Danthonia intermedia cusickii Williams

Cusick's oat-grass

Merathrepta intermedia cusickii (Williams) Piper

RANGE: Wash. and Oreg. to Mont. and Wyo.

DESCRIPTION: Stems 1 to 2 ft. high. Leaves numerous, mostly basal, rather soft, nearly flat, slightly rough, narrow and about 4 to 12 in. long; sheaths loose, shining, smooth. Panicle rather open and loose; glumes 1-2 in. or more in length; lemmas about 1-3 in. long, hairy at base and the lower 1-2 of the margins, the teeth awned, the awn from between the teeth flat and 1-3 to 1-2 in. long.

HABITAT: Meadows and moist mountain slopes.

FLOWERING PERIOD: More data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: Palatable, but produces only a small amount of foliage and occurs so sparingly that it is of no importance on the range.

Danthonia parryi Scribn.

Parry's oat-grass

RANGE: From Alb. to n. N. Mex.

DESCRIPTION: Stems 1 to 2 ft. high. Leaves numerous, mostly basal, inrolled, somewhat hairy, narrow and 3 to 8 in. long; sheaths smooth. Panicle narrow, rather loose, with short erect branches, few-flowered; glumes 3-nerved or at base 5 to 7-nerved, 3-5 to 4-5 in. long; lemmas about 11-nerved, hairy all over the back, and with long pointed teeth, the awn from between the teeth about 1-3 in. long.

HABITAT: Valleys and open hillsides at medium elevations, in Colo., 8,500 to 10,000 ft.

FLOWERING PERIOD: More data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: Palatable to all classes of stock but usually of rare occurrence.

Danthonia pinetorum (Piper) Frye & Riggs. See *D. thermale* Scribn.

Danthonia spicata (L.) Beauv.

Spiked oat-grass

RANGE: From Nfd. to S. Dak., n. N. Mex. and N. C.

DESCRIPTION: Stems round, 2-3 to 2 1-2 ft. high. Leaves smooth or sparsely hairy, numerous, mostly basal, 4 to 6 in. long, often curled, those of the stem, 1 to 2 in. long, erect. Panicle few-flowered, the few short branches erect or ascending, often reduced to a raceme; spikelets 5 to 8-flowered, about 1-2 in. long, on short, stiff pedicels; glumes about 1-2 in. long or less, smooth; lemmas 1-6 to 1-5 in. long, sparsely pubescent with stiff hairs, teeth triangular, the awn over 1-5 in. long. Also known as Poverty-grass.

HABITAT: Dry, sandy or rocky soil. Its presence is usually considered as indicative of a sterile or at least impoverished soil.

FLOWERING PERIOD: July and Aug.

SEED DISSEMINATION: Aug. and Sept.

FORAGE VALUE: Not very palatable and probably of little value. More data needed.

Danthonia thermale Scribn.

Northwest oat-grass

D. pinetorum (Piper) Frye & Riggs

Merathrepta pinetorum Piper

RANGE: Brit. Col. and Wash. to Mont. and n. Wyo.

DESCRIPTION: Stems slender, erect, 5 to 20 in. high. Leaves narrow, hairy, especially so on the upper surface. Panicle 1 to 2 in. long, densely few-flowered, the branches 1 to 2-flowered; glumes about 1-2 in. long, and 1-8 in. wide, 5 to 7-nerved; lemmas about 1-5 in. long, including the very sharp-pointed teeth about 1-16 to 1-12 in. long, hairy on the back and more densely so on the margin.

HABITAT: Clearings and parks, usually on gravelly soil.

FLOWERING PERIOD: More data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: Not very palatable and produces only a fair amount of foliage. In places it occurs rather abundantly but is not important.

Danthonia unispicata Munro

Single-spiked oat-grass

D. californica unispicata (Munro) Thurb.

Merathrepta unispicata (Munro) Piper

RANGE: From w. Mont. and n. w. Wyo. to e. Wash. and n. e. Cal.

DESCRIPTION: Stems 6 to 8 in. high. Leaves numerous, basal, 6 to 8 in. long, hairy. Panicle a single, terminal spikelet on a flexuous pedicel about 1-2 in. long; glumes about 1-2 to 3-4 in. long, smooth, about 7-nerved; lemmas about 1-5 to 1-3 in. long, smooth, hairy at base and on the margins, gradually contracted into 2 teeth with awns about 1-12 to 1-4 in. long, the awn from between the teeth flat, bent and twisted below and about 1-2 in. long.

HABITAT: In dry, rocky, or partly barren places at low altitudes.

FLOWERING PERIOD: More data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: Palatable to all classes of stock, usually produces a moderate amount of forage and often occurs abundantly so that it is somewhat important on rocky soils.

Dasychloa pulchella (H. B. K.) Willd. See *Tridens pulchellus* (H. B. K.) Hitchc.

DESCHAMPSIA

Annuals or perennials of *Aveneae*, the Oat tribe of grasses. There are about 20 species in the cold and temperate regions of the world. The genus *Deschampsia* is characterized by: Spikelets 2, rarely 3-flowered, in narrow or open panicles; glumes about equal, thin or dry and membranaceous; rachilla prolonged behind the upper floret as a hairy bristle; lemma 4-nerved, 2 to 4-toothed, bearing a slender awn from below the middle of the back.

Many of the species are palatable and nutritious and furnish considerable forage in meadows and moist places.

Deschampsia atropurpurea (Wahl.) Scheele

Mountain hair-grass

RANGE: From Lab. to s. e. Alaska and the Aleutian Islands and s. in the mts. to N. E and N. Y. in the East and to Colo. and Oreg. in the West.

DESCRIPTION: A tufted perennial with slender, erect, leafy stems 6 to 20 in. high. Leaves not tufted at the base, the sheaths smooth, the blades nearly so, flat, 2 to 5 in. long and 1-8 to 1-5 in. wide. Panicle 1 to 4 in. long, few-flowered; the few smooth, slender, flexuous branches spreading or sometimes drooping, spikelet bearing at the ends; spikelets 1-5 to 1-4 in. long, open-flowered; glumes longer than the florets; awn from about the middle of each lemma, bent and about 1-8 to 1-6 in. long.

HABITAT: Alpine situations usually in parks, meadows and open timber.

FLOWERING PERIOD: July to Sept.

SEED DISSEMINATION: Aug. and Sept.

FORAGE VALUE: Palatable and nutritious to all classes of stock but seldom abundant enough to be important.

Deschampsia atropurpurea latifolia (Hook.) Scribn. Broad-leaved hair-grass
Aira latifolia Hook.

RANGE: Oreg., Wash. and n. Rockies.

DESCRIPTION: Closely resembles the species; differs chiefly in having broader leaves, about 1-4 in. wide.

HABITAT: About the same as the species.

FLOWERING PERIOD: About the same as the species.

SEED DISSEMINATION: About the same as the species.

FORAGE VALUE: About the same as the species.

Deschampsia brachyphylla Nash. See *D. curtifolia* Scribn.

Deschampsia caespitosa (L.) Beauv. Tufted hair-grass

RANGE: From Nfd. to Alaska, s. to N. J., Ill. and Minn., N. Mex. and Cal. Also in Europe and Asia. One of the most widely distributed grasses of the Western mountain ranges. It has been submitted from 50 National Forests and all 6 districts.

DESCRIPTION: A tufted perennial with smooth, erect, slender, unbranched stems 2 to 4 ft. high. Leaves flat or the basal ones becoming inrolled, 2 to 6 in. long, rough on upper surface, smooth on lower; sheaths smooth. Panicle 4 to 8 in. long, the slender, rough branches spikelet bearing near the ends; spikelets about 1-6 in. long, open-flowered; awns from near the base of and but little longer than the lemmas, falling away at maturity.

HABITAT: Abundant in bottomlands, canyons and meadows but rarely seen in dry or rocky situations. It generally has a wide altitudinal range and reaches well up toward timber line.

FLOWERING PERIOD: July to Sept.

SEED DISSEMINATION: Aug. and Sept.

REPRODUCTION: Produces a large amount of seed of about average viability.

FORAGE VALUE: Greatly relished by all classes of stock. In some localities it grows too rank to be of highest value for sheep but cattle and horses graze it readily. It is common and often the predominating grass in mountain meadows, furnishing the bulk of the forage. Sometimes cut for hay. It withstands close grazing.

Deschampsia calycina Presl. See *D. danthonioides* (Trin.) Munro.

Deschampsia curtifolia Scribn. Sheep hair-grass
D. brachyphylla Nash, not Philippi

RANGE: From s. Alaska in the mts. through Mont. to Colo.

DESCRIPTION: Densely tufted perennial 8 to 16 in. high. Leaves numerous at base, 2 to 6 in. long, narrow, inrolled, the stem leaves about 1 to 2 in. long. Panicle contracted or spreading, 1 to 4 in. long; spikelets 1-8 to 1-6 in. long; awns about 1-2 longer than the lemmas. Known locally as Sheep redtop.

HABITAT: Wet alpine slopes; in Mont. at elevations of about 9,500 and in Colo. 11,000 to 12,000 feet.

FLOWERING PERIOD: July and Aug.

SEED DISSEMINATION: Aug. and Sept.

FORAGE VALUE: Palatable and nutritious to all classes of stock. Reported from the Rio Grande N. F. as excellent feed for sheep. It produces much foliage and where it occurs abundantly is important.

***Deschampsia danthonioides* (Trin.) Munro**

Annual hair-grass

D. calycina Presl

RANGE: From e. Alaska southw. to Idaho and Lower Cal. Also in Peru.

DESCRIPTION: A rather slender, erect, tufted annual 6 to 15 in. high. Leaves few, very narrow, about 1-2 to 4 in. long. Panicle open 3 to 6 in. long, the slender branches stiffly ascending, bearing a few spikelets toward the ends; glumes 1-4 to 1-3 in. long, and longer than the florets; the base of the lemmas and the rachilla hairy; the awns bent, 1-6 to 1-4 in. long.

HABITAT: Moist soils in parks.

FLOWERING PERIOD: July and Aug.

SEED DISSEMINATION: Aug. and Sept.

FORAGE VALUE: It is palatable to all classes of stock, but produces only a small amount of forage, is pulled up readily, has a short growing period and limited abundance and is therefore of no importance.

***Deschampsia elongata* (Hook.) Munro**

Slender hair-grass

RANGE: From s. e. Alaska to w. Mont., Utah and Cal. and s. into s. Mex.

DESCRIPTION: A slender, often tufted perennial; in Alaska an annual, and nearly always with the appearance of an annual because of its shallow roots and the preponderance of slender, erect, naked stems 1 to 4 ft. high. Leaves flat, very narrow, mostly smooth, the basal cluster usually thread-like, 1 1-2 to 6 in. long. Panicle narrow, 1-2 to 1 ft. long, the branches slender and erect; glumes 1-6 to 1-4 in. long exceeding the florets in length; lemmas hairy at base, the awns bent and about 1-6 in. long.

HABITAT: Generally in dry park areas but adaptable to moist soil.

FLOWERING PERIOD: July and Aug.

SEED DISSEMINATION: Aug. and Sept.

FORAGE VALUE: Medium or less than medium in palatability except in the spring, and is easily pulled up by stock. After about mid-summer the leaves become air-dried and it is then disregarded by all stock.

***Deschampsia gracilis* Vasey**

Graceful hair-grass

RANGE: Cal., s. Oreg. and n. Nev.

DESCRIPTION: An annual with stems 1 to 2 ft. high. Leaves, smooth, usually thread-like, 2 to 4 in. long. Panicle 3 to 8 in. long, open, the branches slender, rather densely flowered toward the ends, naked below; glumes 1-6 to 1-4 in. long; the base of the lemmas hairy; awns bent, 1-6 to 1-4 in. long.

HABITAT: Moist, well-drained meadows.

FLOWERING PERIOD: More data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: Eaten by all classes of stock but usually not closely cropped.

***Deschampsia holciformis* Presl**

California hair-grass

RANGE: In Cal. along the coast as far s. as Monterey Co. Also collected on the Wallowa N. F., Oreg.

DESCRIPTION: A smooth, tufted, fibrous-rooted perennial with rather stout stems 2 to 4 ft. high. Leaves tightly folded or inrolled, firm, mostly basal, smooth or

somewhat rough, especially toward the tip, the lower 16 in. long, the upper 1 1-2 to 2 1-2 in. long. Panicle erect, narrow, rather dense, 6 to 8 in. long; awns straight.

HABITAT: Marshes, bogs and moist places.

FLOWERING PERIOD: Apr.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: It is probably of some value for hay and forage in the low marshes along the coast.

Diarrhena diandra (Michx.) Wood. See *Korycarpus diandrus* (Michx.) Kuntze.

Digitaria sanguinalis (L.) Scop. See *Syntherisma sanguinalis* (L.) Dulac.

Dinebra bromoides H. B. K. See *Bouteloua radicata* (Fourn.) Griff.

Diplachne dubia (H. B. K.) Scribn. See *Leptochloa dubia* (H. B. K.) Nees.

Diplachne imbricata (Thurb.) Scribn. See *Leptochloa imbricata* Thurb.

DISTICHLIS

Distichlis is a member of *Festuceae*, the Fescue-Bluegrass-Brome tribe. There are approximately 5 species native to temperate America. They are rigid, erect perennials, with stout rootstocks and dense panicles of rather few spikelets; spikelets many-flowered, with staminate (male) and pistillate (female) flowers in separate spikelets on separate plants, strongly flattened; glumes unequal, firm, keeled and abrupt-pointed; lemmas leathery, rigid, faintly many-nerved.

Distichlis spicata (L.) Greene

Salt-grass

D. stricta (Torr.) Rydb.

RANGE: Throughout the U. S. and Mex.

DESCRIPTION: Stems 4 in. to 2 ft. high. Sheaths overlapping; blades rigidly ascending, 1-2 to 6 in. long and 1-12 to 1-6 in. wide. Panicle narrow, 1 to 3 in. long; spikelets 1-3 to 2-3 in. long, the florets closely overlapping. Also known as Alkali-grass.

HABITAT: It thrives on strongly alkaline soils where other vegetation will not grow. It also grows in cultivated fields where it often becomes a nuisance.

FLOWERING PERIOD: May to Aug.

SEED DISSEMINATION: July to Sept.

FORAGE VALUE: This grass makes good feed for both cattle and horses. If stock eat it before it becomes dry they will continue to eat it as new growth is formed. In parts of the Middle West it often grows rank enough, on medium alkaline soils, to be cut for hay, but it is wiry and difficult to mow where occurring in pure stands.

Distichlis stricta (Torr.) Rydb. See *D. spicata* (L.) Greene.

Eatonia obtusata (Michx.) Gray. See *Sphenopholis obtusata* (Michx.) Scribn.

ECHINOCHLOA

Echinochloa is a rather small genus of 12 species belonging to the Millet tribe (*Paniceae*) of the Grass family. They are found mostly in the warmer regions of both hemispheres. Two species are quite extensively cultivated abroad for their grain, viz.: Shama millet or Jungle-rice (*E. colona*) and the Sanwa millet

of Japan (*E. frumentaceum*). Another species, Barnyard-grass (*E. crus-galli*) is one of the commonest and best known of weedy grasses.

Species of *Echinochloa* are mostly annuals and are usually tall, coarse and "weedy"; they have, for the most part, flattened leaf-sheaths and long, broad leaf-blades. The inflorescence is in the form of terminal panicles composed of stout, 1-sided racemes, the spikelets are nearly sessile, crowded, and 1-flowered or sometimes with a staminate (male) flower below the perfect, terminal one. The glumes are unequal in length, covered with stiff, bristly or even spiny hairs, and are unawned. The sterile lemma, or so-called "3d glume," is similar to the glumes in appearance except that it is usually awned from the apex; the fertile lemma and the palea are papery in texture and tapering-pointed. The grain is free.

The name *Echinochloa* is derived from the Greek *echinos* (hedgehog) and *chloa* (grass), alluding either to the bristly glumes or the awned sterile lemmas, or both.

***Echinochloa crus-galli* (L.) Beauv.**

Barnyard-grass

Panicum crus-galli L.

RANGE: Throughout the U. S. and s. Can.; usually stated in the books as "introduced from Europe." There are several forms presented by this species. That growing as a weed around barnyards and dwellings was probably introduced from Europe; there are, however, a number of forms which have every appearance of being native.

DESCRIPTION: An annual. Variable, 1 to 4 or even 7 ft. high, usually branching from the base, erect or ascending, often spreading when young and becoming upright on maturity. Base of stems and nodes often stained with purple. Leaf-sheaths smooth; leaf-blades often smooth, 1-4 to 1 in. wide, 4 in. to 2 ft. long. Panicles 3 to 12 in. long, composed of about 5 to 15 sessile, erect or ascending branches, or the lower branches spreading at about right angles. Spikelets egg-shaped, green or purplish, densely and irregularly crowded in 2 to 4 rows. Sterile lemma long-awned or nearly awnless. The scientific name is derived from the Latin *crus* (leg) and *galli* (of a cock) referring to the resemblance of the panicle to a cock's lower leg and foot.

Known also as Cockspur-grass, Barn-grass, Goose-grass, Water-grass and Slough-grass.

HABITAT: Cultivated and waste places; commonly around barns and dwellings and in manured soils; also on river banks, along irrigation ditches and in other moist to wet sites. Will not grow in very dry soils, although it will endure alkali to some extent. In Colo. (fid. Rydberg) it occurs between 4,000 and 5,500 feet. Collected in a wet draw on the Tusayan N. F. at 6,700 feet.

FLOWERING PERIOD: Mainly June and July.

SEED DISSEMINATION: Aug. to Oct.

FORAGE VALUE: Usually not abundant enough on the range to be important, but it is grazed by all classes of stock especially in the forepart of the season. It is reported to be occasionally grown for hay in N. Mex. on land that is too wet for anything else. The hay, however, is hard to cure properly and often gets moldy. It produces a very heavy crop of green fodder of rather inferior quality.

The following interesting comments on this grass are quoted from U. S. Dept. Agr. Div. Agros. Bull. 3 and 14:

"A tall, smooth form occurs in N. Mex., Ariz., and the Mojave desert region, springing up after the summer rains in all swampy places or lowlands. It grows to the height of 6 or 7 ft., and its seeds, which it produces abundantly, are col-

lected by the Mojave Indians, ground into flour, and cooked for food. The poorer classes of India also use the grain for food. A variety introduced from Japan has been cultivated at some of the experiment stations and treated as a millet. At the Hatch Expt. Sta., in Mass., the crop produced was very uniform, averaging 7 ft. in height. The yield was at the rate of 11,207 pounds of straw per acre and 66.7 bushels of seed. When sown for silage or for soiling at the rate of one peck of seed to the acre, the yield was at the rate of from 15 to 18 tons per acre. It is very much liked by stock, and is a valuable forage plant for feeding green or for the silo. It is not so well adapted for hay, as it is a coarse, succulent grass, and rather difficult to dry.''

Echinochloa zelayensis (H. B. K.) Schult.

Mexican echinochloa

Oplismenus zelayensis H. B. K.

RANGE: From N. Mex. and Ariz. southw. through Mex. into S. Am. Apparently unknown from Cal.; what appears to be the only record for Oreg. is a U. S. F.S. specimen from the Crater N. F., apparently a stray.

DESCRIPTION: A perennial. Stems tufted, frequently branching, 1 to 2 ft. high. Leaf-sheaths hairless; leaf-blades large, smooth, broadly linear, flat, with rough margins. Panicle narrow, almost spike-like. Spikelets very short-awned. Glumes blunt. Known also as Spiked echinochloa and Water-grass.

HABITAT: Occurs in a great variety of situations, such as: Wet soils, pond banks, dry ditches, in shallow pools, along roadsides, in dry river beds, etc. Known originally from an elevated plateau (about 6,500 ft.) near Zelaya, State of Michoacan, Mex., whence the scientific name *zelayensis*. Collected in a wet soil, at 6,000 ft., on the Apache N. F. Collected in dry gravelly loam, at 1,380 ft., near Medford, Crater N. F.

FLOWERING PERIOD: Mainly July.

SEED DISSEMINATION: Mainly Aug. and Sept.

FORAGE VALUE: More data needed. The plant produces abundant, though sometimes rather coarse leafage and it would seem probable that, wherever sufficiently abundant, the species would be an important element of the forage crop, at least in the more succulent stages of growth.

ELYMUS

A genus of erect, tufted perennials, with the exception of an annual species, *E. caput-medusae*, introduced from Europe, with characteristically flat leaves and dense, terminal spikes, belonging to the *Hordeae*, Barley-Wheat tribe of the Grass family. The spikelets are somewhat flattened, mostly 2 to 6-flowered, the uppermost imperfect, usually in pairs (rarely single or in 3's or 4's) and sessile at the notched nodes or false joints of the zigzag rachis or spike-axis; the rachis is, however, continuous, and does not break up at maturity. The glumes are nearly equal in length, rigid, usually narrow, often awl-like, sharp-pointed or awned, usually 1, sometimes 3, rarely 4 or 5-nerved, persistent, and subtend the florets like an involucre. The lemmas are shorter than the glumes, rounded on the back, obscurely 5-nerved, blunt or sharp-pointed or awned from the apex. The rachilla or axis of the spikelet is jointed above the glumes and between the florets. The paleas are a little shorter than the lemmas and 2-keeled, giving them a rather flattened aspect on the back. The grain is adherent to the lemma and palea and is somewhat hairy at the apex.

Members of this genus are commonly known as Wild rye, Rye-grasses or Lyme-grasses; they are not, however, congeneric with the cultivated rye-grasses, which

belong to the closely related genus *Secale*. *Elymus* differs from *Secale* in its species being perennial instead of annual, in the broader glumes (the glumes of *Secale* are extremely narrow, even awn-like, and 1-nerved), the more numerous-flowered spikelets (spikelets of *Secale* are nearly 2-flowered), and its adherent, instead of free grain; moreover, except in certain cultivated forms, *Secale* has a jointed, dis-articulating spike-axis; many species of *Elymus* are native, but *Secale* is a small genus of 2 species, both native to the Mediterranean Sea region.

Elymus contains about 25 species, approximately 20 of which occur in N. Am.; they are found chiefly in the temperate and colder regions of both hemispheres. In the U. S., the State of Wash., with 14 species, is about the center of distribution; Colo. has 12 species; Mont., 8; Cal., 7; N. Mex. and Alaska, 6 each, and entire Mex. has but 3 species.

While somewhat coarse, members of this genus have considerable economic importance at least for horses and cattle; they come up, as a rule, very early in the spring, at which time they are most palatable, often grow in very dry localities, make good hay and, on account of their height, project above the snow and are eagerly sought by stock in winter.

***Elymus ambiguus* Vasey & Scribner**

Colorado rye-grass

RANGE: Known originally from Colo., where it is most common, although since collected in Wyo. and in Mont.

DESCRIPTION: A somewhat peculiar species, as its scientific name would indicate, erect, densely tufted, rigid, leafy, usually from 2 to 4 ft. high. Leaves of sterile shoots erect, narrow, spirally inrolled, 12 to 18 in. long; stem leaves about 4 in number, smooth or slightly roughened, rigid, 4 to 10 in. long, with long sheaths. Spike erect, rather densely flowered, 3 to 5 in. long, the rachis or spike-axis nearly cylindrical and rough to the touch; spikelets roughish, numerous-flowered (from 5 to 9), 1-2 to 3-4 in. long or about twice as long as the joints of the rachis, somewhat spreading, and 2 together at each joint of the rachis, except sometimes for single spikelets at the top or the bottom of the spike. Glumes rigid, very narrow and bristle-like, rough, about 1-2 in. long. Lemmas about as long as glumes or slightly less, smooth or nearly so, obscurely 5-nerved; palea 2-toothed at apex, about as long as the lemma. Grain nearly 1-3 in. long.

HABITAT: Canyons and hillsides. Between 6,000 and 9,000 ft., in Colo., fid. Rydberg.

FLOWERING PERIOD: More data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: More data needed.

***Elymus aristatus* Merrill**

Purple rye-grass

RANGE: Confined to Wash. and Oreg., e. of the Cascades.

DESCRIPTION: Rather stout, smooth, pale-colored, tufted, erect, 2 to 3 ft. high. Leaf-blades flat, about 1-3 in. wide, smooth beneath, roughish and streaked above, 4 to 8 in. long; leaf-sheaths shorter than the internodes. Spike rather densely flowered, 3 to 6 in. long, erect, purplish; spikelets numerous (2 to 8) flowered, 2 or 3 at each node. Glumes awl-like, 1-5 in. wide at the base, about 1-2 in. long, rough; lemmas lance-shaped, 1-4 to 1-3 in. long excluding the awns, roughish, tapering into stout, straight, rough awns, 1-8 to 1-5 in. long. Closely related to wheat-like rye-grass (*E. triticoides*) which it much resembles in habit, but it has no root-

stocks as does *E. triticoides*, and has much longer glumes, rough instead of smooth lemmas, and the lemma-awns are 3 to 5 times as long.

HABITAT: In moist valleys and along streams, often growing in large clumps.

FLOWERING PERIOD: More data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: Reported to be good feed, at least for cattle and horses.

***Elymus borealis* Scribner**

Alaskan rye-grass

RANGE: From Alaska s. to the Olympic Mts. of Wash. Reported also from the Wallowa N. F., but its occurrence there somewhat doubtful. Originally known from Alaska.

DESCRIPTION: Rather slender, erect, seldom as much as 3 ft. high. Leaf-blades linear to lance-shaped, soft, flat, nearly 2-5 in. broad, rough on the edges, 4 to 7 1-2 in. long. Spike slender, inclined to be nodding, usually interrupted, 2 1-2 to 5 in. long, the axis noticeably rough to the touch. Spikelets 2 to 3-flowered, about 3-5 in. long exclusive of the awns; glumes lance-shaped, 3-nerved, about 1-3 in. long exclusive of the short terminal awns, which are 1-8 to 1-6 in. long; lemmas about 2-5 in. long, hairy on the margins, especially toward the apex, with straight or somewhat wavy awns 4-5 to 1 in. long. Remarkable in this genus because of the fringe of hairs on the lemmas, a character which, together with its longer and broader glumes, distinguishes it from the very closely related Siberian rye-grass (*E. sibiricus*).

HABITAT: In damp to wet sites, in the Hudsonian or Whitebark Pine Zone.

FLOWERING PERIOD: More data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: More data needed. Presumably of such sparse distribution and local occurrence in continental U. S. as to be of very minor importance.

***Elymus canadensis* L.**

Canadian rye-grass

RANGE: Widely distributed in Canada and the U. S. In the U. S. it has been collected in every State except perhaps Fla. and La., probably being most abundant in the Great Plains region.

DESCRIPTION: Typically greenish, although there is at least one decidedly whitish variety; smooth with rather stout stems from 2 to 6 ft. high. Leaf-blades rough, 4 or 5, flat or sometimes inrolled, 6 to 12 in. long, 1-5 to 4-5 in. wide; leaf-sheaths mostly longer than the internodes. Spike loose or interrupted below, nodding, usually 4 to 9 in. long, exerted from the topmost leaf-sheath. Spikelets usually 2 at a joint, 3 to 5-flowered. Glumes hairy, awl-like, about 1-25 in. wide, 3 or 4-nerved, the nerves tapering into an awn usually shorter than the glume. Lemmas also hairy, about 1-2 in. long, terminating in slender, rough, usually spreading awns, 0.8 to 1.2 in. long.

HABITAT: In a variety of sites, such as sandy soils, loess, rather dry hillsides, river banks, rich shaded woods, bars, moist and dry prairies, in low thickets and in open forests. It is often very abundant on prairies, in low flats and along streams. Between 4,000 and 7,000 ft. in Colo. and up to 6,000 ft. in Mont. (fid. Rydberg). In Wyo. (fid. Nelson) it is most abundant in the drier regions of the e. part of the State.

FLOWERING PERIOD: June and July.

SEED DISSEMINATION: July and Aug.

FORAGE VALUE: Reported from U. S. F. S. District 1 that "a large amount of inferior forage is produced due to the rough, coarse leaves and long awns. This

plant is grazed only when there is a distinct shortage of desirable forage." It is stated to be one of the most promising native hay grasses of Tex. and when young and green, stock of all kinds eat it. In valley lands of Iowa and Nebr. it is reported sometimes to make up over half the wild hay. It makes excellent hay, if cut in time. In the middle West it is usually cut in Aug., but it is better to cut it earlier on account of the ergot which often forms in the heads.

Elymus condensatus Presl

Giant rye-grass

RANGE: Brit. Col. and Sask. to n. w. Nebr., Ariz. and Cal., in the last-named State being especially common in the coastal region from San Francisco southward. It apparently does not occur in Mex., and there seems to be no record of its collection in N. Mex.

DESCRIPTION: The largest of all our native rye-grasses, with tall, coarse stalks, from 3 to 7 or even 12 ft. high, and often 1-2 in. thick, from strong, heavy, knotted rhizomes. Leaf-blades smooth, flat, sometimes as much as 5-6 in. wide and 2 ft. long. Spike erect, usually dense, up to 1 ft. long, sometimes compound with branches 1 or 2 in. long. Glumes awl-like, awn-pointed. Lemmas usually awn-pointed. Grows in large clumps, sometimes 5 to 7 ft. in diameter; very striking because of its height; "the most conspicuous grass throughout the entire southwestern part" of Wyo.

HABITAT: "Usually in moderately dry situations where soil is good. Associated with wheat-grass, sagebrush and buckbrush. Fairly abundant" (Caribou N. F.). On dry plains, along streams, in wet saline situations, along ditches, in gullies and canyons, on hillsides where it is often about the only thing that will grow; it is perhaps most common in rich, open, medium moist or rather dry meadows. "Abundant in Colo. between 4,500 and 5,500 ft."

FLOWERING PERIOD: June and July. Reported as July on the Caribou N. F.

SEED DISSEMINATION: July to Sept.

FORAGE VALUE: "Eaten to a limited extent by all classes of stock when very young, but too coarse and woody for forage when older" (Caribou N. F.). In the e. Rocky Mt. region it is reported to be, though coarse, "important forage." It is considered excellent winter forage in Cal. It is reported to be widely distributed in U. S. F. S. District 6, where it is not considered as having value as a forage plant on the range, but is gathered plentifully for hay, making good roughage during the winter. The occurrence of ergot on the heads of this grass has been noticed in the vicinity of the Colville N. F. It probably infests the species elsewhere, but stockmen are not familiar with it and, therefore, do not attribute sickness or loss among stock to this poison. When allowed to stand it makes a large amount of winter forage for cattle and horses. It is a good binder for railway embankments and the like. The seeds are used as food by many Indians.

Elymus glaucus Buckley

Western rye-grass

RANGE: From s. and w. Ont. and Mich. northwestward to Alb. and Brit. Col. and southwestward to Mo., N. Mex. and Cal. In the large variety *E. glaucus maximus* it also occurs in Alaska. It is perhaps the most common and widely distributed, all regions considered, of the rye-grasses occurring on National Forests; it has so far been collected on 34 National Forests and in all U. S. F. S. districts.

DESCRIPTION: Rather variable in habit, smooth, pale green, often somewhat whitish in aspect, 2 to 5 ft. high. Leaf-blades relatively thin, 1-6 to 5-8 in. wide,

smooth beneath, often somewhat rough above, usually flat but occasionally inrolling, 4 to 12 in. long, spreading; leaf-sheaths smooth or roughish. Spike narrow and slender, erect, usually dense, long exserted from the topmost leaf-sheath, 2 to 8 in. long. Spikelets smooth, 3 to 6-flowered, in pairs, the pairs about 1-3 in. apart, erect, closely pressed to the spike-axis. Glumes narrowly lance-shaped, about 1-3 to 1-2 in. long, slightly shorter than the lemmas, rigid, 3 to 5-nerved, tapering or awn-pointed. Lemmas smooth or slightly rough, tipped with a slender, straight, roughish awn, 2-5 to 4-5 in. long.

HABITAT: Characteristically in open woods or conifer forests, on moist to medium dry hillsides and the like. In Colo. it occurs (fid. Rydberg) between 7,000 and 11,000 ft. In N. Mex. (fid. Wooton & Standley) it occurs in the n. part of the State in mountain meadows, often among bushes, in the Transition (Y. P.) Zone. On the Santiam N. F. it is reported as "not abundant, scattering over burned areas" and was collected at 4,500 ft. in a gravelly loam, s. slope. Collected at 8,400 ft. on the Manti N. F. in open conifer timber, and, on the Targhee N. F., at 6,800 ft., where its local occurrence is reported as "scattering in woods in canyons." On the Ruby N. F. collected in a sandy loam soil at 7,000 ft., where it is stated that it "grows on hillsides and along creeks, and seems to do better under about 5% cover." On the Shasta N. F. collected at about 5,000 ft. in rather open conifer timber. Collected on the Whitman N. F. on an open hillside at 5,500 ft., and the following notation made: "Abundant on old sheep bedding grounds and seems to grow on open ground where other grass has been killed out."

FLOWERING PERIOD: June and July. Given as July on the Santiam N. F.

SEED DISSEMINATION: July to early Sept. Given as about Sept. 1 on the Santiam N. F.

REPRODUCTION: Aggressive, with strong seed ~~habits~~ and usually producing seeds of high viability. Seeds are reported to germinate about Oct. 1 on the Santiam N. F.

FORAGE VALUE: "Grazed to a very limited extent by cattle and horses" (Manti N. F. and Targhee N. F.). "Palatable to sheep and cattle" (Santiam N. F.). "Good. Best suited to horses and cattle. Withstands trampling well, having a strong root system" (Wallowa N. F.). It usually occurs somewhat scatteringly, but it is a very nutritious grass and, in the forepart of the season before it becomes too coarse, it is often regarded as one of the most valuable of the secondary species on cattle and horse ranges.

Elymus hansenii Scribn. See *Sitanion hansenii* (Scribn.) J. G. Smith.

Elymus innovatus Beal

Beardless rye-grass

RANGE: From Arctic Alaska southeastward to Mont., Wyo., and the Dakotas; it is apparently absent from Wash. and Oreg.

DESCRIPTION: Somewhat slender, erect, rather rigid, 1 1-2 to 3 ft. high, very leafy at the base, with creeping rootstocks. Sterile shoots numerous, their leaf-blades, as well as basal leaves, rough, flat or inrolling, 8 to 12 in. long. Stem leaves usually 3, the blades 1 1-2 to 4 in. long; leaf-sheaths usually shorter than the internodes. Spike erect, protruded only a little from the uppermost leaf-sheath, rather densely hairy, 2 1-2 to 4 in. long. Spikelets pubescent, 2 at a joint, 3 to 6-flowered, 2-5 to 3-5 in. long. Glumes reduced to small bristle-like organs, 1-7 to 2-5 in. long; lemmas oval to lance-shaped, conspicuously longer than the glumes, about 1-3 to 1-2 in. long, pubescent, terminating in a short awn-point; palea nearly or quite as long as its lemma. Very closely related to Brown's rye-

grass (*E. brownii*) of the Black Hills of S. Dak., from which it differs in its longer spike, narrower glumes and more robust habit. Sometimes called Leafy rye-grass.

HABITAT: Well-drained soils, medium to higher elevations.

FLOWERING PERIOD: More data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: More data needed.

***Elymus leckenbyi* Piper**

Leckenby's rye-grass

RANGE: Apparently known only from Wash., e. of the Cascade Mts.

DESCRIPTION: A little known species. It is characterized mainly by its erect spikes, short, awl-like glumes, and the very long (1 1-4 to 2 in.) awns on the lemmas.

HABITAT: Sandy bars of rivers and other well-drained sites.

FLOWERING PERIOD: More data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: More data needed.

***Elymus robustus* Scribner & Smith**

Robust rye-grass

RANGE: Not known as yet with much precision, but may be stated as from Mont. s. through the Rocky Mt. region to N. Mex. and e. to Iowa, Ill., Mo. and Ark. Also reported from s. e. Conn. The range is thus seen to be approximately the same as the optimum range of Canadian rye-grass (*E. canadensis*) of which, in fact, some authorities suspect it will yet prove a variety or form.

DESCRIPTION: Robust, erect, 2 1-2 to 4 ft. high. Leaf-blades firm and broad, rough on both surfaces, 1-3 to nearly 1 in. wide, 4 to 16 in. long. Spike broad, 5 to 11 in. long, the base usually inclosed to some extent in the upper leaf-sheath. Spikelets erect or somewhat spreading, 3 to 5-flowered, numerous and close together except, perhaps, at the base. Lemmas roughish, with spreading awns usually over 1 in. long. Very close to *E. canadensis*, from which it differs chiefly in being more robust, in having a more densely flowered spike, the spikelets closely ranked and either not interrupted below or else much less interrupted than in the case of *E. canadensis*, and in having a somewhat wavy or bent, instead of a straight awn.

HABITAT: On river banks, in sandy soils and valleys and on moist prairies. Between 5,000 and 6,000 ft. in Colo. (fid. Rydberg).

FLOWERING PERIOD: June and July.

SEED DISSEMINATION: July to Sept.

FORAGE VALUE: More data needed. In N. Mex. Agr. Expt. Sta. Bull. 81, pp. 148 and 154, it is reported that this species has been under cultivation for several years in the n. part of Grant. Co.

***Elymus saundersii* Vasey**

Saunders' rye-grass

RANGE: Known only from centr. and w. Colo.

DESCRIPTION: A little-known grass, erect, the leaf-blades narrow (less than 1-5 in. wide), flat, usually nearly erect; leaf-sheaths much shorter than the internodes. Spike narrow, 4 to 6 in. long; spikelets narrow, erect. Glumes very narrow, linear to lance-shaped; lemmas tipped with stiff, rough, purplish awns, which are about 1 1-2 to 1 3-5 in. long. Known also as Colorado rye-grass.

HABITAT: In the mountains.

FLOWERING PERIOD: More data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: More data needed.

Elymus triticoides Buckl.

Wheat-like rye-grass

E. triticoides Nutt. in herb., but unpublished.

RANGE: From Mont. to Wash. and s. to N. Mex., Cal. and Lower Cal. One of the 3 species of *Elymus* known to occur in Mex. and the only species, except short-stalked rye-grass (*E. brachystachys*) which is known to occur both in the U. S. and Mex.

DESCRIPTION: Stems 20 in. to 4 ft. high, usually not over 2 1-2 ft., from strong, rather slender, scaly, creeping rootstocks. Stems and leaves usually of a somewhat whitish aspect. Leaf-blades usually inrolled, narrow (usually about 1-5 in. or less wide) 6 to 10 in. long. Spike somewhat slender, not dense, often loose, erect, sometimes branched. Spikelets 4 to 8-flowered, 1 to 3 together at each node. Glumes very narrow, awl-like, rigid, about equal in size, 5-12 to 7-12 in. long. Lemmas shorter than glumes, broadly lance-shaped, 1-4 to 5-12 in. long, smooth, firm, 7-nerved above, the nerves indistinct below, and ending in a short, sharp point or else a very short awn. Except for its rootstocks and its much more scattering habit of growth it might readily be taken for a dwarf form of Giant rye-grass (*E. condensatus*) to which, in fact, it is very closely related. The specific name *triticoides* refers to its resemblance to wheat (*Triticum*). Also known as Slender rye-grass.

HABITAT: In meadows, woods and on hillsides. Collected at 6,350 ft. on the Manti N. F., where it is reported to occur scatteringly in bunches on foothills in the sage type. It is rather rare in N. Mex., occurring in the high mts., mostly in the Canadian (lodgepole pine and Engelmann spruce) Zone. In Colo. (fid. Rydberg) it is found between 6,000 and 9,000 ft. In Cal. it is most abundant in rich bottom lands in the warmer valleys, where it often grows so thickly as to seem to have been artificially sown. It is also found in alkaline soils. In Mont. (fid. Rydberg) it seldom forms big bunches, but grows scatteringly, usually in meadows. In Cal., on the other hand, it usually occurs in clumps.

FLOWERING PERIOD: May to July.

SEED DISSEMINATION: July to Sept.

FORAGE VALUE: "Grazed to a limited extent by cattle and horses; too coarse to make good forage" (Manti N. F.). On the very arid, alkaline bluffs about Green River, Wyo., it is almost the only grass that occurs and is reported to be an important forage plant there. In Oreg. it is often cut for wild hay and is commonly regarded as a valuable grass.

EPICAMPES

Epicampes is an entirely American, mainly Mexican and South American genus belonging to the *Agrostideae*, Redtop-Timothy tribe of the Grass family; there are about 16 species known.

Members of this genus are tall perennials, with usually very long, dense, spike-like panicles; small, 1-flowered spikelets; membranaceous glumes slightly unequal in size and a 3-nerved lemma, a little shorter than or equal to the glumes and usually tipped with a slender, mostly short awn. The grain is free.

To this genus belongs the well-known Mexican whisk (*E. macroura*), whose roots furnish the raw material for the manufacture of many of the whiskbrooms and brushes of commerce.

Epicampes ligulata Scribn.

Liguled whisk-grass

RANGE: From w. Tex. to Ariz. and in n. Mex.

DESCRIPTION: Stout, smooth, erect, 2 to 4 ft. high. Lower leaves 1 to 1 1-2 ft. long, 1-6 to 1-4 in. wide, rigid, rough. Ligule, from which the species gets its name,

much elongated and conspicuous, somewhat hardened, 1-2 to 1 1-5 in. long. Panicle 7 to 16 in. long, narrow, but not strictly spike-like, more open than that of the closely related deer-grass (*E. rigens*), the branches nearly erect and flowering to the base, somewhat scattered. Spikelets very small, about 1-12 in. long, usually purplish. Lemma not hairy, unawned, with an attendant palea about equal in length. Known also as Liguled deer-grass or Purple deer-grass.

HABITAT: Cool slopes, canyons and rocky pine woods.

FLOWERING PERIOD: June and July.

SEED DISSEMINATION: Aug. and Sept.

FORAGE VALUE: More data desired. Its value, however, is indicated in the fact that recent attempts have been made to cultivate it by the Univ. Ariz. Agr. Expt. Sta.

***Epicampes rigens* Benth.**

Deer-grass

RANGE: Cal. from Butte Co. southw. through Nev. and Ariz. to s. N. Mex. and w. Tex.; also in n. Mex. A typically Southwestern grass.

DESCRIPTION: Stout, erect, mostly 3 to 4 ft. high, but sometimes as low as 20 in. Leaf-sheaths mostly smooth, longer than the internodes so that they cover up the nodes; leaf-blades usually inrolled and narrow, forming a long-tapering point, coarse, rough and rigid. Panicle dense, spike-like, green, 10 in. to 2 ft. long usually, but sometimes as short as 4 or 5 in. Glumes whitish, shorter than the awnless lemma. Plant often grows in hummocks 1 or 2 ft. across and 4 to 6 in. above surface of ground; bases of stalks often clothed with dead leaf-sheaths.

HABITAT: Reported to be common in Ariz. between about 6,500 and 7,500 ft. Stated to be uncommon in N. Mex., occurring only in the s. part of the State and almost wholly in the s. w. corner. Usually in sandy soils, in open parks, high plains, gullies, open forest, draws subject to flooding, and the like.

FLOWERING PERIOD: June to Aug.

SEED DISSEMINATION: July to Nov.

FORAGE VALUE: Highly palatable, being closely grazed wherever stock can get it. In the Southwest it is considered one of the best native dry-land grasses.

ERAGROSTIS

Eragrostis is a genus of annual or perennial grasses belonging to the *Festuceae*, Fescue-Brome-Bluegrass tribe of the Grass family. They vary greatly in size, are much-branched or simple-stemmed, and have contracted or open panicles of 2 to many-flowered, somewhat flattened spikelets, the uppermost floret of each spikelet being imperfect. The spikelets in a few cases are unisexual, the male and female flowers being borne on the same or even on separate plants. The rachilla of the spikelet is articulated, but usually does not readily break up. The glumes are keeled, usually somewhat unequal in length, and, for the most part, shorter than the lemmas. The lemmas are 3-nerved, smooth, blunt or sharp-pointed, but not awned; they fall in fruit, often leaving the paleas persistent. The grain is free, loosely inclosed in the lemma and palea. The genus is closely allied to *Poa*, but has 3-nerved, instead of 5-nerved, and smooth, instead of more or less hairy lemmas. It is a difficult genus for botanists on account of the variability of the species.

Over 100 species of *Eragrostis* are known, probably the majority of which are native to the Old World; they occur chiefly in the tropics, subtropics or the warmer temperate regions. To this genus belongs the well-known cereal, Teff, of n. Africa (*E. abyssinica*).

Eragrostis limbata Fourn.

Bordered eragrostis

RANGE: From San Diego Co., Cal., and Ariz. southw. through Mex. to Costa Rica.

DESCRIPTION: An annual. Slender, branching, about 6 to 18 in. high. Leaves narrow, rather short, flat or sometimes inrolled. Panicles short and erect, usually 4 in. long or less, the branches rather widely spreading, the lower branches hairy in the axils. Spikelets linear, about 1-10 in. wide. Resembles Hairy eragrostis (*E. pilosa*), but differs in its relatively smaller panicles and larger spikelets. The scientific name *limbata*, refers to the limbate, i. e., bordered spikelets, which are often tinged with purple around the edges. Known also as Bordered love-grass.

HABITAT: In waste places, along railroad tracks, along streams, on sandy prairies, limestone hills, open woodland and among cactus. Rather frequently a weed in cultivated fields.

FLOWERING PERIOD: More data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: More data needed.

Eragrostis lugens Nees

Pan-American eragrostis

RANGE: From San Diego Co., Cal., to Tex. (also in s. Fla.) and southw. to Argentina. Originally known from Paraguay.

DESCRIPTION: An erect perennial, 2 or 3 ft. high (Fla. form is 8 to 12 in. high). Leaf-sheaths smooth; leaf-blades mainly basal, narrow, flat, inrolled at the tips only or completely involute; very hairy at the ligule. Panicle large, loose and open, about 1-2 the length of entire plant, the lower branches hairy in the axils. Spikelets on pedicels at least as long as themselves, about 1-4 to 1-3 in. long, narrow, smooth, often purplish. Lateral nerves of lemmas very faint. The scientific name *lugens* means "mourning," alluding to the drooping or "weeping" spikelets and panicles. Known also as Paraguay love-grass, Mourning love-grass and Loose-panicled eragrostis.

HABITAT: Sandy prairies, dry sterile hills, lava rock, drier meadows and open woodland. Often common. More frequent in s. Ariz. and s. N. Mex. than in the n. portions of those States. One of the important constituents of the South American pampas.

FLOWERING PERIOD: More data needed; flower stalks seem to be usually produced early in the spring.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: Often highly regarded as a forage plant. It provides good winter grazing because it cures naturally and the bases of the stems and basal leaves remain somewhat green and succulent throughout the winter. In N. Mex. Agr. Expt. Sta. Bull. 81 this species is said to "add a little to the forage" in that State. In Ariz. (see Univ. Ariz. Agr. Expt. Sta. Bull. 65) it is reported to be "much eaten by stock wherever its growth is at all accessible on the mountain slopes, and even where it grows on the steeper slopes it is the first species to be picked out. It is one of the earliest grasses to begin growth in the spring."

Eragrostis major Host. See *E. megastachya* (Koel.) Link.

Eragrostis megastachya (Koeler) Link

Strong-scented eragrostis

E. major Host.

RANGE: A native of the Old World, now widely naturalized in the Western Hemisphere; it is found in Ont., practically throughout the U. S. and Mex., and widely distributed in S. Am. In the U. S. most common in the s. part.

DESCRIPTION: A rather showy, handsome annual, 6 in. to 2 ft. high, the stems rather large but weak, erect or ascending from a somewhat reclining base, purplish at the nodes, and branching freely from the base. Leaves flat, relatively broad, 2 to 6 in. long. Panicle triangular in outline, somewhat contracted, 2 to 6 in. long. Spikelets of a greenish lead-color, 1-8 to 1-5 in. wide and about 1-4 to 2-3 in. long, densely, 10 to 40-flowered, the florets closely grooved into each other. Lemmas thin, the lateral nerves prominent, the keels rough and gland-bearing; these glands, when fresh, emit a rather disagreeable odor, described by some as "sickish sweet" and by others to be of a fetid, snake-like character. The scientific name, *mega* (large) and *stachys* (stalk) refers to the thickened culms or flower-stalks. Allusions to its peculiar odor are seen in the common names: Candy-grass, Snake-grass, Pungent meadow-grass and Stink-grass.

HABITAT: Fields, waste places, roadsides, dry river beds, barren hills, dooryards and beside walks; less common on mesas and in the mountains.

FLOWERING PERIOD: Mainly June and July.

SEED DISSEMINATION: Mainly Aug. and Sept.

FORAGE VALUE: More data needed. N. Mex. Agr. Expt. Sta. Bull. 81 reports that "stock will rarely eat it." Reported from the Apache N. F. to be "fair forage."

Eragrostis mexicana (Lag.) Link

Mexican eragrostis

RANGE: From s. Cal. to w. Tex. and southw. through Centr. Am. to parts of S. Am.

DESCRIPTION: A short-rooted annual, like *E. megastachya* emitting a rather disagreeable odor when fresh. Stems one to several, erect or spreading, 6 in. to 2 ft. high. Sheaths hairy at throat. Blades slender, mostly flat, usually 2 to 5 in. long. Panicles relatively large, spreading-branched, sometimes drooping, hairless in the axils of the branches, 4 to 12 in. long. Spikelets greenish lead-color, flattened, 1-6 to 1-4 in. long, about 1-12 in. wide, mostly 6 to 12-flowered, on flexuous pedicels as long as or longer than the spikelets. Glumes tapering. Lemmas smooth, about as long as glumes, the lateral nerves rather indistinct. Known also as Skunk-grass, Stink-grass and Six-weeks grass.

HABITAT: Mostly in lowlands; a common weed in fields and waste places. Found occasionally along rocky beds of intermittent streams and on mesas in poorly stocked, open woodland type.

FLOWERING PERIOD: Aug.

SEED DISSEMINATION: Sept.

FORAGE VALUE: Reported to be "fair forage while green but of little or no value after frost" on the Apache N. F. On the Coconino N. F. stated to be "eaten to some extent." On the Prescott N. F. it is reported to be grazed by "horses and cattle." In the Owens Valley of Cal. this grass takes possession of gardens after the period of cultivation and is then considered a serious pest.

Eragrostis neomexicana Vasey

New Mexican eragrostis

RANGE: From w. Tex. to s. e. Cal. Originally known from N. Mex.

DESCRIPTION: An annual, rather stout, branching and leafy, 1 to 4 ft. high. Blades flat. Panicle large, open and spreading, 8 to 16 in. long. Spikelets 1-5 to 1-3 in. long, 9 to 15-flowered. Lemmas bristly-rough on the keel near the sharp-pointed apex. Resembles somewhat the cultivated Teff of n. Africa (*E. abyssinica*); it springs up quickly after rains.

HABITAT: Said to be "about the commonest annual of the genus" in N. Mex., occurring mainly in the Y. P. type. Most common below 5,000 ft. in Ariz.

FLOWERING PERIOD: July.

SEED DISSEMINATION: Aug. and Sept.

FORAGE VALUE: Lamson-Scribner reports this species to be "a valuable hay grass." Wooton & Standley (see N. Mex. Agr. Expt. Sta. Bull. 81) report that they have never seen the species used in that way in N. Mex. and state also that "horses will not eat it while green. They do not like the queer oily odor. Whether other stock will eat it or not we are unable to say."

***Eragrostis pectinacea* (Michx.) Steud.**

Purple eragrostis

RANGE: From Me. to Fla. and westw. to S. Dak., Colo. and N. Mex. Also southw. to centr. Mex.

DESCRIPTION: A tufted perennial with erect or ascending stems, 1 to 3 ft. high, from short, stout rootstocks. Leaf-sheaths typically clothed with appressed hairs, overlapping, and densely bearded at the throat; leaf-blades 4 to 12 in. long, 1-6 to 1-3 in. wide, often inrolled on drying. Panicle reddish-purple, more than 1-2 the length of the entire plant, open and spreading, more or less inclosed at the base in the uppermost leaf-sheath or exerted after the upper spikelets have fallen; branches of panicle hairy in the axils. Spikelets on stiffish pedicels at least their own length, narrow, 5 to 15-flowered, 1-3 in. long or less. Lateral nerves of lemmas very prominent.

The plant has a "tumble-weed" structure since the entire panicle breaks off at maturity not far above the ground, it being then borne by the wind often for considerable distances, its progress being expedited by the horizontally spreading branches which act as sails. Known also as Meadow comb-grass, Tumbleweed love-grass and Pink-grass.

HABITAT: Dry hills, sandy plains, and the like.

FLOWERING PERIOD: June and July.

SEED DISSEMINATION: Aug. to Oct.

FORAGE VALUE: More data needed.

***Eragrostis pilosa* (L.) Beauv.**

Hairy eragrostis

RANGE: Originally known from India. Widely naturalized in the temperate and warmer regions of both hemispheres. In the U. S. it occurs from Me. to Fla. and westw. to Minn., Nebr. and s. Cal. Some forms, however, appear to be native to the U. S. Found extensively also in Europe, the West Indies, S. Am. and Australia.

DESCRIPTION: A slender, dark colored annual, variable as would be expected from its enormous range. Stems erect or decumbent at base or spreading, 6 to 18 in. high, often branching profusely from the base. Leaf-sheaths sparingly bearded at the throat; leaf-blades slender, smooth, 1 to 5 in. long. Panicle widely spreading, often somewhat drooping, usually at least sparsely hairy in the axils of the lower branches. Spikelets extremely narrow (about 1-25 in.) 1-6 to 2-5 in. long, as long as or somewhat shorter than the pedicels, 5 to 18-flowered. Lemmas minute, sharp-pointed, the lower ones usually purplish. Known also as Small tufted love-grass, Slender meadow-grass, and India love-grass.

HABITAT: Fields, waste places, ditch and river banks, sandy-gravelly plains, etc. A common late summer and fall weed in plowed land in the Southwest.

FLOWERING PERIOD: July.

SEED DISSEMINATION: Aug. and Sept.

FORAGE VALUE: "Of no value for feed" (Woot. & Standl. in N. Mex. Agr. Expt. Sta. Bull. 81). Reported as "fair forage" on the Gila N. F. In this country the plant is commonly looked upon as a weed, but it is regarded in Australia and India as an excellent forage grass, while its seeds form part of the diet of natives in certain regions of the latter country. Wherever it is abundant it is usually of some importance for grazing.

Eragrostis secundiflora Presl

Sandy eragrostis

RANGE: Kans. to Fla. and s. Cal. and southw. into Mex.

DESCRIPTION: A rather ornamental perennial, erect, with unbranched stems 6 in. to 3 ft. high. Leaf-sheaths bearded at the throat, shorter than the internodes, the ligule reduced to a ring of hairs; leaf-blades narrow, flat or inrolled, 2 to 12 in. long. Panicle narrow and interrupted, not spike-like, 1 1-2 to 6 in. long, the branches 1-2 to 1 1-2 in. long, erect or ascending. Spikelets many-flowered, strongly flattened, usually tinged with red or purple, sessile or nearly so, crowded or clustered. Lemmas about 1-8 in. long, prominently 3-nerved, rough on the keel, their rather elongated tips somewhat spreading. Known also as Clustered love-grass, Purple love-grass and Blowout eragrostis.

HABITAT: Sand dunes, sandy prairies, "blowouts" of the sandhill regions, seashores, etc.

FLOWERING PERIOD: June and July.

SEED DISSEMINATION: Aug. and Sept.

FORAGE VALUE: Grazed limitedly.

Eriocoma cuspidata Nutt. See *Oryzopsis hymenoides* (Roem. & Schult.) Ricker.

FESTUCA

The fescues as the species of *Festuca* are commonly known, are annual or perennial, usually tufted or bunch grasses of the *Festuceae* or Fescue-Bluegrass-Brome tribe. This tribe is the largest main division of the Grass family. The genus *Festuca* is represented by about 100 species distributed throughout the world but occurring chiefly in the temperate and cooler regions. North America is represented by approximately 30 perennial and 12 annual species and a number of varieties.

They are characterized chiefly by: 2 to several-flowered spikelets in narrow or open panicles; narrow, abrupt-pointed glumes, the first 1-nerved, the second 3-nerved; lemmas firm, rounded on the back at least below, pointed or with an awn from the tip, rarely blunt or rounded at the end or awned from a cleft apex, and faintly 3 to 5-nerved.

With few exceptions, the fescues are palatable and nutritious and since they often cover large areas nearly to the exclusion of all other grasses, they are important in all parts of the West. Several species are of high value in hay meadows.

Festuca altaica Trin.

Siberian fescue

RANGE: Siberia and in N. Am., from Alaska to Lab. and s. to Que., N. Dak. and Brit. Col. Also collected once in Oreg., and on the Shasta N. F. in Cal.

DESCRIPTION: A densely tufted, rather coarse perennial in very large tufts, with erect stems 1 to 3 ft. high. Leaves inrolled, smooth or rough beneath, the blades

finally falling away from the persistent sheaths. Panicle loose and open, erect, 4 to 8 in. long; spikelets 3 to 5-flowered and about 1-2 in. long, or longer.

HABITAT: Dry rocky soils.

FLOWERING PERIOD: July and Aug.

SEED DISSEMINATION: Aug. and Sept.

FORAGE VALUE: Palatable to cattle and horses but too coarse for sheep. On the Shasta N. F. it locally occurs very abundantly in the upper Y. P. type, and in Alaska often large areas are covered with its tussocks.

***Festuca arizonica* Vasey**

Arizona fescue

F. ovina arizonica (Vasey) Hack.

RANGE: S. Colo., N. Mex. and Ariz., possibly also in s. Utah.

DESCRIPTION: An erect tufted perennial 4 in. to 3 ft. high. Leaves numerous at the base, 3 to 5 on the stem, stiff, very narrow, cylindrical or bristle-like, rough margined and 6 to 10 in. long. Panicle narrow, 3 to 5 1-2 in. long, the branches alternate, erect and close to the stem. Spikelets about 1-2 in. long, borne on short stalks, 4 to 5-flowered; lemmas with a short awn or beard 1-12 in. or less in length. This is the southwestern form of *F. idahoensis*. In the Southwest it is known as Pine grass.

HABITAT: In pine woods, on rocky slopes and in open parks at elevations of from about 6,000 to 10,000 ft.

FLOWERING PERIOD: June and July.

SEED DISSEMINATION: July to Sept.

FORAGE VALUE: Excellent forage for all classes of stock when green during the early part of the rainy season. Soon becomes rather tough and dry and is not eaten as readily as blue grama and the other very palatable forage plants of this region, but if the stock are held on it they graze it fairly close and do well. It occurs in such dense stands in the higher mountains of n. Ariz. that it furnishes the bulk of the forage on these ranges and since it withstands grazing well it will continue to be the most important grass there.

***Festuca brachyphylla* Schult.**

Alpine fescue

F. ovina brachyphylla (Schult.) Piper

RANGE: In arctic or alpine situations in the Northern Hemisphere. In N. Am. it occurs from Alaska to Lab. and s. in the East to Vt., in the Rocky Mts. to Ariz., and in the Sierras to Cal. It appears to be absent in the Cascade Mts. but occurs in the Blue Mts. of Oreg.

DESCRIPTION: A low, but erect, compactly tufted perennial 2 to 8, rarely 12, in. high. Leaves mostly basal, smooth, soft, green, cylindrical, but becoming angled in drying, about 1-2 as long as the stems, the sheaths closed their whole length or nearly so. Panicle narrow, 1 to 2 in. long, few-flowered; the glumes and lemmas broad, rather soft; awn of the lemmas about 1-24 in. long.

HABITAT: Arctic alpine localities in rather barren soil.

FLOWERING PERIOD: July to Sept.

SEED DISSEMINATION: Sept. and Oct.

FORAGE VALUE: A valuable forage for sheep wherever accessible and sufficiently abundant. This species is considered one of the 15 most important grasses in District 2 and is reported as furnishing the principal sheep feed at high elevations on the Inyo N. F., Cal.

Festuca bromoides L.

Brome-like fescue

RANGE: From Brit. Col. to s. Cal. Introduced from Europe.

DESCRIPTION: An erect, or rarely bent at base, annual, with smooth stems 3 to 12, rarely 16, in. high. Leaves flat or loosely inrolled, smooth, 1 to 3 in. long. Panicle usually dense, narrow, 2 to 4 in. long; spikelets pale green, 4 or 5-flowered; lemmas tipped with an awn about 1-2 in. long.

HABITAT: Dry hills and meadows.

FLOWERING PERIOD: More data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: Palatable to all classes of stock though not important due to its small size, short growing period and lack of distribution and abundance.

Festuca californica Vasey

California fescue

RANGE: From middle Cal. to n. e. Oreg.

DESCRIPTION: A coarse tufted perennial, with stout, rough stems 2 to 5 ft. high. Leaves numerous, hard, somewhat rough, 4 to 16 in. long and up to 1-5 in. broad. Panicle usually loose 4 to 12 in. long; spikelets usually 5-flowered, 1-3 to 3-4 in. long.

HABITAT: Meadows, sandy banks, and borders of woods or dry situations. Usually at medium elevations.

FLOWERING PERIOD: June and July.

SEED DISSEMINATION: July and Aug.

FORAGE VALUE: Relished by horses and grazed to some extent by cattle but it is rather coarse for sheep. It generally occurs only scatteringly.

Festuca calligera (Piper) Hitchc.

Brown fescue

F. ovina calligera Piper

RANGE: Rather imperfectly known but in general from n. Wyo. to centr. Ariz. and w. to n. Cal. and s. Oreg.

DESCRIPTION: A densely tufted perennial 6 to 20 in. high, distinguished by the pale leaf-blades and the persistence of the brown, dry, papery leaf-sheaths on the flower stalk. Leaf-blades cylindrical, harshly roughened and about 2 to 6 in. long. Lemmas awned.

HABITAT: In medium stands in dry meadow areas.

FLOWERING PERIOD: May to Aug.

SEED DISSEMINATION: July to Sept.

FORAGE VALUE: Very good forage for all classes of stock.

Festuca capillata Lam. See *F. ovina capillata* (Lam.) Hack.**Festuca confinis** Vasey

Spiked fescue

F. kingii Scribn.

RANGE: From Mont. to Nebr., Colo., Cal. and Oreg.

DESCRIPTION: A densely tufted, pale green perennial, occasionally producing stout, scaly stolons. Stems stout, smooth, 1 1-2 to 3 1-2 ft. high. Leaves flat or loosely inrolled, coarsely grooved, 1-8 to 1-4 in. wide and 4 to 12 in. long. Panicle narrow, erect, 3 to 8 in. long, the branches short and pressed close to the stem; lemmas not awned.

HABITAT: Dry meadows, hillsides and in canyons at medium elevations.

FLOWERING PERIOD: June and July.

SEED DISSEMINATION: July and Aug.

FORAGE VALUE: Affords good feed for all classes of stock when young. Becomes rather tough later and is eaten then to some extent by cattle. Generally

occurs in too scattering quantities to be important but is valued in some parts, however, as winter forage.

Festuca confusa Piper

Dry-land fescue

RANGE: Middle Cal. to Wash.

DESCRIPTION: An annual with slender erect stems 6 to 18 in. high. Leaves soft, loosely inrolled, pubescent, less than 2 in. long. Panicle about 2 to 4 in. long. This species closely resembles *F. pacifica* but differs chiefly by having the blades pubescent, spikelets 2 to 3-flowered and the glumes hairy.

HABITAT: Dry hillsides.

FLOWERING PERIOD: More data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: Probably good forage during the early part of its short growth period, but so scattered as to be of no economic importance.

Festuca elatior L.

Meadow fescue

F. pratensis Huds.

RANGE: A native of Europe but now widely cultivated and fairly well established throughout the U. S. as far south as N. C., Tenn., N. Mex. and Cal. Also in s. Canada.

DESCRIPTION: A loosely tufted perennial with long fibrous roots, short creeping rootstocks and erect, hard 3-jointed stems 1 1-2 to 4 ft. high. Leaves usually abundant at base, 1-6 to 1-3 in. wide and 4 to 24 in. long, firm, flat, smooth beneath and rough above. Panicle erect, 4 to 8 in. long, varying from much branched to nearly the single stem, the branches spikelet bearing nearly to the base.

HABITAT: Thrives best on moist soils rich in humus but occurs wild in meadows, along roadsides and in waste places.

FLOWERING PERIOD: July and Aug.

SEED DISSEMINATION: Aug. and Sept.

FORAGE VALUE: An exceedingly valuable grass for pasturage or hay. Cattle are especially fond of it. Chemical analyses show it to be remarkably high in albuminoids and nitrates so that it is both a muscle building and a fattening feed.

Festuca hallii (Vasey) Piper

Hall's fescue

RANGE: Brit. Col. and Wash. to Sask., N. Dak. and Colo.

DESCRIPTION: A densely tufted perennial with erect, 2-jointed stems 1 to 3 ft. high, and numerous, hard, usually very rough and strongly inrolled leaves, 4 to 12 or even 20 in. long, the basal ones breaking off from the persistent sheaths. Panicle narrow and rather close, often one sided, 1 to 6 in. long; spikelets 4 to 6-flowered, and 1-3 to 1-2 in. long. Closely resembles *F. altaica* but differs in having a narrower panicle and the stem and closely inrolled leaves usually very rough.

HABITAT: Dry soils.

FLOWERING PERIOD: July and Aug.

SEED DISSEMINATION: Aug.

FORAGE VALUE: Probably palatable to cattle and horses but too coarse for sheep. More data needed.

Festuca idahoensis Elmer

Blue bunchgrass

F. ingrata (Hack.) Rydb.

F. ovina ingrata Hack.

RANGE: From middle Cal. to Brit. Col., Alb. and Colo.

DESCRIPTION: An erect, densely tufted, fibrous rooted perennial 1 to 3 ft. high. Leaves numerous, mostly basal, rather stiff and firm, rough, usually inrolled and

3 to 12 in. long. Panicle narrow, 4 to 8 in. long and very rough. Spikelets 4 to 6-flowered; the awns about 1-12 to 1-6 in. long. This species closely resembles *F. arizonica* of the Southwest and may prove to be the same. It differs principally by having a slightly longer awn and by the sheaths not becoming spread or flattened out at the base as in *F. arizonica*.

HABITAT: Widely distributed and generally very abundant on dry open sites at low or medium elevations. Also occurs, sometimes abundantly, on rather moist sites.

FLOWERING PERIOD: June to Aug.

SEED DISSEMINATION: Aug. and Sept.

REPRODUCTION: Produces a large amount of seed which has a comparatively high viability.

FORAGE VALUE: Palatable to all classes of stock although in the Northwest, it is not grazed as readily as *F. viridula*, but because of its wider distribution and greater abundance it is more important and is ranked next to *Agropyron spicatum* as the best forage grass in District 6. It is considered the sixteenth most important grass in District 2. As is the case with *F. arizonica* of the Southwest, this species is readily grazed in the spring when young and tender but becomes rather tough and dry during the summer and then is not grazed readily, though if stock are held on it they graze it rather close and put on a solid flesh.

***Festuca ingrata* (Hack.) Rydb.** See *F. idahoensis* Elmer.

***Festuca kingii* Scribn.** See *F. confinis* Vasey.

***Festuca megalura* Nutt.**

Long-panicled fescue

RANGE: From Brit. Col. and Idaho to Lower Cal. and Mex. Also along the Pacific Slope of S. Am. and in Portugal.

DESCRIPTION: An erect annual 4 to 24 in. high, with smooth, slender leaves 2 to 5 in. long. Panicle narrow, 1 to 8 in. long, the branches erect; spikelets 4 to 5-flowered. Very closely resembles *F. myuros* and differs only in that the lemmas are sparsely hairy on the margin of the upper half and the panicles are usually longer.

HABITAT: Cultivated or open ground, sandy soil and waste places.

FLOWERING PERIOD: May to July.

SEED DISSEMINATION: July and Aug.

FORAGE VALUE: Palatable to all classes of stock especially in the early part of the season. It is abundant on the Pacific Slope and is spreading rapidly in Wash. and Idaho.

***Festuca microstachys* Nutt.**

Small fescue

RANGE: Cal. and s. w. and centr. Oreg.

DESCRIPTION: An erect annual, 8 to 20 in. high with smooth stems and smooth or pubescent leaf-blades and sheaths, the blades narrowly linear and 1 1-2 to 4 in. long. Panicle erect, 2 to 4 in. long; spikelets 1 to 3-flowered; lemmas pubescent ending with an awn as long or slightly shorter. Very closely resembles *F. reflexa* but differs by having pubescent lemmas.

HABITAT: Banks, hillsides and open ground.

FLOWERING PERIOD: More data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: Probably palatable to all classes of stock but of little economic importance due to its lack of distribution and abundance.

***Festuca microstachys pauciflora* Scribn.** See *F. reflexa* Buckl.

***Festuca minutiflora* Rydb.**

Small-flowered fescue

RANGE: Colo.

DESCRIPTION: A tufted perennial 2 to 14 in. high. Leaves mostly basal, smooth, soft, narrow, cylindrical and 1-2 to 4 in. long, 2 to 3-flowered; lemma terminating in a short awn. Closely related to *F. brachyphylla* but differs chiefly in the smaller spikelets and the laxer panicle.

HABITAT: Alpine situations at elevations of from 10,000 to 12,000 ft.

FLOWERING PERIOD: July and Aug.

SEED DISSEMINATION: Aug. and Sept.

FORAGE VALUE: Palatable to all classes of stock, especially sheep, but generally not abundant enough to be of any economic importance.

***Festuca myuros* L.**

Rat's-tail fescue

RANGE: A European plant commonly introduced in the e. U. S. but rare in the interior and on the Pacific coast.

DESCRIPTION: A smooth, erect annual 8 to 24 in. high, with slender, smooth leaves 2 to 5 in. long. Panicle narrow, 3 to 8 in. long, the branches erect; spikelets 4 or 5-flowered. Very closely resembles *F. megalura*, differs only in that the lemmas are not hairy on the margin.

HABITAT: Open ground, fields and waste places.

FLOWERING PERIOD: June and July.

SEED DISSEMINATION: July and Aug.

FORAGE VALUE: Palatable to all classes of stock but of such rare occurrence that it is of no economic value.

***Festuca occidentalis* Hook.**

Western fescue

RANGE: From Brit. Col. to middle Cal., centr. Utah, Wyo. and Mich.

DESCRIPTION: A densely tufted perennial with slender stems 1 1-2 to 3 ft. high, perfectly smooth up to the inflorescence. Leaves abundant, bright green, soft, smooth, cylindrical, about 2 to 8 in. long. Panicle 3 to 8 in. long, loose, flexuous; the branches mostly slender; spikelets loosely 3 to 5-flowered, 1-5 to 2-5 in. long; lemmas thin and tipped with a slender awn about as long.

HABITAT: An abundant species in open woods up to 10,000 feet.

FLOWERING PERIOD: May to July.

SEED DISSEMINATION: July and Aug.

FORAGE VALUE: Furnishes excellent forage for all classes of stock and is ravenously grazed. Owing to the fineness of the herbage it is especially good sheep feed.

***Festuca octoflora* Walt.**

Slender fescue

RANGE: From Brit. Col. to Que., Fla., Tex. and Lower Cal.

DESCRIPTION: An annual with slender, smooth, erect stems 4 to 18 in. high, often tufted. Leaves soft, inrolled, mainly basal, 1 to 3 in. long. Panicle 1 to 6 in. long, narrow, the branches short and usually erect; spikelets 1-4 to 1-3 in. long, densely 5 to 13-flowered.

HABITAT: Dry sandy soil and waste places.

FLOWERING PERIOD: June to Aug.

SEED DISSEMINATION: July to Sept.

FORAGE VALUE: Grazed to a limited extent by all classes of stock, being inferior to most fescues. It is of considerable value in semi-arid grazing regions as it springs up quickly when the rainy season begins and furnishes grazing when nothing else is available; also early in the spring it provides the first green forage.

Festuca octoflora hirtella Piper

Hairy slender fescue

RANGE: Middle Cal. to centr. Utah, Ariz. and Lower Cal.

DESCRIPTION: Differs from the species by growing usually in low spreading tufts, and in having the foliage more pubescent and the lemmas with a minute rigid pubescence.

HABITAT: Similar to the species but generally in more arid situations.

FLOWERING PERIOD: May to June.

SEED DISSEMINATION: June to July.

FORAGE VALUE: Same as the species and generally occurs more abundantly.

Festuca ovina L.

Sheep fescue

RANGE: Occurs native in N. Am. in the Rocky Mts. from Alb. to w. S. Dak., N. Mex. and Utah and about the Great Lakes. Through cultivation it is more or less commonly introduced in many localities in the U. S. and has been collected on National Forests in centr. Oreg. and e. Cal. Also a native of Europe and Asia.

DESCRIPTION: A densely tufted perennial with 3-jointed, erect stems 6 to 24 in. high. Leaves mainly basal, narrow or cylindrical, pale green, firm, rough on the margins, the basal ones 2 to 5 in. long, those of the stem often very short. Panicle contracted after blooming, commonly 2 to 4 in. long with the branches ascending; spikelets usually 1-5 to 1-3 in. long, 3 to 6, or rarely, 9-flowered; awns not longer than the leathery lemmas. Distinguished from *F. rubra* by the lack of creeping rootstocks.

HABITAT: Widely distributed and one of the principal grasses in sagebrush and rather dry, open areas at medium elevations. A highly drought resistant species, requiring considerable sunlight.

FLOWERING PERIOD: June to Sept.

SEED DISSEMINATION: Aug. to Oct.

FORAGE VALUE: Palatable to all classes of stock, especially valuable for sheep. The numerous fine basal leaves furnish considerable forage and as they are always green this species is one of the principal grasses grazed during the fall and latter part of the summer. It is considered one of the three most important grasses in District 6 and one of the 15 most important in District 2.

Festuca ovina arizonica (Vasey) Hack. See *F. arizonica* Vasey.

Festuca ovina brachyphylla (Schult.) Piper. See *F. brachyphylla* Schult.

Festuca ovina calligera Piper. See *F. calligera* (Piper) Hitchc.

Festuca ovina capillata (Lam.) Hack.

Thread-leaved fescue

F. capillata Lam.

RANGE: From Me. to N. J., Miss., Mich. and e. Can. Introduced from Europe.

DESCRIPTION: Differs from the species in having very slender and cylindrical thread-like leaves and awnless lemmas.

HABITAT: Fields, roadsides and waste places.

FLOWERING PERIOD: June and July.

SEED DISSEMINATION: July and Aug.

FORAGE VALUE: In Europe it is considered a good sheep feed but in this country

it is usually rather scattering in occurrence and, being somewhat dry and stiff, it is not held in high esteem as forage.

Festuca ovina ingrata Hack. See *F. idahoensis* Elmer.

Festuca ovina pseudovina Hack. See *F. pseudovina* Hack.

Festuca ovina supina (Schur) Hack. See *F. supina* Schur.

Festuca pacifica Piper

Pacific fescue

RANGE: From Brit. Col. to Ariz. and Lower Cal.

DESCRIPTION: An annual with slender, smooth stems 4 to 20 in. high, erect or bent at the base. Leaves soft, smooth, loosely inrolled, and 1 to 2 in. long. Panicle 2 to 5 in. long; spikelets 3 to 6-flowered; glumes smooth. This species closely resembles *F. confusa* but differs chiefly in the smooth leaf-blades and smooth glumes.

HABITAT: Open ground, mountain slopes and open woods.

FLOWERING PERIOD: May and June.

SEED DISSEMINATION: June and July.

FORAGE VALUE: Probably palatable during its short growth period but not economically important because of its small size, scattered occurrence and short life.

Festuca pratensis Huds. See *F. elatior* L.

Festuca pseudovina Hack.

False sheep fescue

F. ovina pseudovina Hack.

RANGE: From Sask. to Brit. Col., e. Oreg., Utah, Colo. and Mich. Also in Europe.

DESCRIPTION: A densely tufted perennial with stems 8 to 18 in. high. Leaves mostly basal, smooth, green, soft, cylindrical, becoming angled in drying, 2 to 6 in. long, the sheaths closed only at the base. Panicle narrow, 1 to 2 1-2 in. long, its branches very short; awn short.

HABITAT: On moist sandy loam in meadows and also on dry hillsides up to 12,500 feet.

FLOWERING PERIOD: July to Sept.

SEED DISSEMINATION: Aug. and Sept.

FORAGE VALUE: Palatable to all classes of stock but unimportant because of its lack of abundance.

Festuca reflexa Buckl.

Few-flowered fescue

F. microstachys pauciflora Scribn.

RANGE: From Cal. to Utah and Oreg. Also on Vancouver Island.

DESCRIPTION: An annual with a few tufted, 3-jointed stems 8 to 20 in. high. Leaves narrow, flat or loosely inrolled, and 1 to 4 in. long. Panicle 2 to 5 in. long; spikelets usually 1 to 3, or rarely, 4 or 5-flowered, about 1-5 to 1-4 in. long and entirely free from hairs or pubescence. Closely resembles *F. microstachys* and *F. pacifica* but is distinguished from the former by its lemmas being free from pubescence and from the latter by all of its spikelets diverging or drawing away from each other as against only the lower branches of the panicle diverging in *F. pacifica*.

HABITAT: Mesas, rocky slopes and wooded hills.

FLOWERING PERIOD: July and Aug.

SEED DISSEMINATION: Aug. to Nov.

FORAGE VALUE: Probably palatable to all classes of stock but of little value, except in parts of Cal. where it is abundant, because of its lack of abundance.

Festuca rubra L.

Red fescue

RANGE: From Greenl. to Va., Tenn., Colo., Cal., and Alaska. Also in Europe.

DESCRIPTION: A variable species with many ill defined forms, being a loosely tufted perennial from creeping rootstocks. Stems erect, very smooth, 1 1-2 to 3 ft. high, 3 or 4-jointed. Leaves smooth, soft, usually loosely inrolled. Panicle 2 to 8 in. long, usually narrow, the branches mostly erect; spikelets 1-3 in. or less in length, 4 to 6, or rarely, 10-flowered; lemma bearing an awn usually 1-2 as long, or rarely as long as the lemma. It very closely resembles *F. ovina* from which it differs chiefly in having rootstocks.

HABITAT: Varies greatly, from dry open sites or in sandy soil to meadows, usually at rather low elevations.

FLOWERING PERIOD: June to Aug.

SEED DISSEMINATION: Aug. to Sept.

FORAGE VALUE: Palatable to all classes of stock and is abundant enough in many places to be important. It is useful as a sandbinder along the seacoast. In Germany it is regarded as one of the most valuable grasses for dry, sandy meadows. Also is a good grass for lawns and bottomlands.

Festuca rubra kitaibeliana (Schult.) Piper

Hairy red fescue

RANGE: From Alaska to Greenl. and s. to Oreg., Wyo., Ont. and N. H. Also in Europe and n. Asia.

DESCRIPTION: Varies from the species by having the spikelets pubescent with short hairs, rather than smooth or only slightly roughened.

HABITAT: Dry soils and river banks.

FLOWERING PERIOD: More data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: Palatable to all classes of stock but of little value because of its lack of abundance.

Festuca rubra megastachys Gaud.

Big-stalked red fescue

RANGE: Que. to N. J. and in the West from Brit. Col. to Oreg.

DESCRIPTION: Varies from the species by having slightly larger spikelets, 2-5 to 1-2 in. long.

HABITAT: Dry or moist usually sandy soils.

FLOWERING PERIOD: More data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: Palatable to all classes of stock but of such scattering occurrence that it is of little value.

Festuca subulata Trin.

Bearded fescue

RANGE: From s. e. Alaska to n. Cal., Utah and Wyo.

DESCRIPTION: A rather slender, loosely tufted perennial with erect, 2 to 4-jointed stems 16 to 32 in. high and flat, thin leaves dark green above, paler beneath, 4 to 12 in. long and from 1-8 to nearly 1-2 in. broad. Panicle very loose and somewhat drooping 6 to 16 in. long with slender, flexuous, rough, angled branches, lemmas terminating in awns from 1-5 to 4-5 in. long.

HABITAT: In humus soil.

FLOWERING PERIOD: June to Aug.

SEED DISSEMINATION: July to Sept.

FORAGE VALUE: Palatable to all classes of stock but occurs too scatteringly to be of any importance.

Festuca supina Schur

Small sheep fescue

F. ovina supina (Schur) Hack.

RANGE: From Greenl. to N. H. in the East and in the West from Brit. Col. and Alb. to Ariz. and Cal.

DESCRIPTION: A densely tufted perennial with erect stems 3 to 12 in. high. Leaves numerous, mostly basal, usually less than 1-2 the length of the stems, inrolled, smooth, firm and hard. Panicle narrow and 1 to 2 in. long. Very closely resembles *F. brachyphylla* but differs chiefly in having firmer and harder leaves, florets looser and more numerous and the awn slightly longer.

HABITAT: High alpine situations in fairly moist soil.

FLOWERING PERIOD: July to Sept.

SEED DISSEMINATION: Sept. and Oct.

FORAGE VALUE: Very palatable to all classes of stock, especially sheep. Though limited in distribution, it is considered one of the 20 most valuable grasses in District 2.

Festuca thurberi Vasey

Thurber's fescue

RANGE: Colo. and Utah to w. centr. Mont.

DESCRIPTION: A densely tufted perennial with erect, hard, 3-jointed stems 2 to 3 ft. high. Leaves closely inrolled, 2 1-2 to 8 in. long, and usually harshly roughened. Panicle 4 to 6 in. long, loose, slightly drooping, the branches spikelet-bearing only above the middle; spikelets 3 to 6-flowered, 1-3 to 1-2 in. long; the lemmas merely sharp pointed.

HABITAT: On hillsides usually in gravelly soil. In Colo. at elevations of from 8,000 to 12,000 ft.

FLOWERING PERIOD: July.

SEED DISSEMINATION: Aug.

FORAGE VALUE: A valuable forage for all classes of stock, especially cattle and horses. The large amount of palatable leaves and its occurrence often in pure stands make this species a valuable forage plant.

Festuca viridula Vasey

Mountain bunchgrass

RANGE: From Idaho and w. centr. Wash. to centr. Cal. and centr. Utah.

DESCRIPTION: A densely tufted, coarse, fibrous and deep rooted perennial with smooth, erect stems 1 1-2 to 3 1-2 ft. high. Leaves erect, narrowly linear and slightly inrolled, soft, slightly rough above, 4 to 12 in. long. Panicle 4 to 6 in. long, loose and open, the branches ascending; spikelets 3 to 6-flowered, about 1-2 in. long; lemmas usually awnless, sometimes awn pointed.

HABITAT: Most common at subalpine elevations on well drained soils in glades and parks, extending well up to timber line. It is a comparatively drought resistant grass.

FLOWERING PERIOD: July and Aug.

SEED DISSEMINATION: Aug. and Sept.

REPRODUCTION: Though the seed of this species has a low viability, enough seed is produced so that by a system of deferred grazing it is possible to revegetate areas on which it occurs even only sparingly.

FORAGE VALUE: Grazed ravenously by all classes of stock. It is relished most at the time of flower stalk production and at this time the entire plant is eaten. Later

in the season sheep continue to eat the leaves with the same relish but the matured flower stalks are seldom eaten. It is considered the fourth most important grass in District 6.

GASTRIDIDIUM

A member of *Agrostideae*, the Redtop-Timothy tribe of grasses. Two species, native to the Mediterranean region, both tufted annuals.

Gastridium australe Beauv. See *G. lendigerum* (L.) Gaud.

Gastridium lendigerum (L.) Gaud.

Nit-grass

G. australe Beauv.

RANGE: Native to the Mediterranean region. Naturalized in Cal., Oreg. and Tex.

DESCRIPTION: Stems smooth, 1-2 to 2 ft. high. Leaves flat, 2 to 5 in. long, about 1-6 in. wide, long-pointed, rough. Panicles 2 to 3 in. long, dense and spike-like; spikelets 1-6 to 1-4 in. long; lemma with a bent awn about 1-5 in. long.

HABITAT: Dry hills and waste places, at moderate elevations.

FLOWERING PERIOD: May and June.

SEED DISSEMINATION: June and July.

FORAGE VALUE: Not known to be grazed in the U. S.; further observations are needed. In its native region it is reported to be palatable to stock. It is cultivated for ornament.

Glyceria spp. See *Panicularia* spp.

Graphephorum melicoideum (Michx.) Beauv. See *Trisetum melicoides* (Michx.) Vasey.

Graphephorum muticum (Boland.) Scribn. See *Trisetum brandegei* Scribn.

Graphephorum wolffii Vasey. See *Trisetum wolffii* Vasey.

HETEROPOGON

A member of *Andropogoneae*, the Beard-grass tribe of grasses. The species of *Heteropogon* occur in the warmer parts of both hemispheres. They are characterized as follows: Annual or perennial; spike densely flowered, appearing one-sided; sessile spikelets awned, fertile, cylindrical; the pediceled ones male and awnless.

Heteropogon contortus (L.) Beauv.

Tangle-head

Andropogon contortus L.

RANGE: From w. Tex. to Ariz. in the U. S. Also in tropical and sub-tropical regions of both hemispheres.

DESCRIPTION: A strongly rooted, tufted perennial with smooth stems branching above, erect, 1 to 3 1-2 ft. high. Leaves 6 to 12 in. long, smooth, flat or folded. Spikes few, cylindrical, about 2 in. long without the awns; rachis with a tuft of brown hairs at each node; awns 2 to 4 in. long, twisted spirally. Known also as Twisted beard-grass.

HABITAT: On dry, rocky or sandy soils. Its strong roots make it a valuable soil binder for river banks, dams and railroad gradings.

FLOWERING PERIOD: Apr. to Oct.

SEED DISSEMINATION: May to Nov.

FORAGE VALUE: Affords excellent grazing in the forepart of the season, but the awns, when developed, are highly injurious to the wool, skin, and throat of sheep. In India the grass is extensively employed for thatch.

HILARIA

Hilaria is a member of *Zoysieae*, the Korean Lawn-grass tribe. It consists of a single species.

Hilaria cenchroides H. B. K.

Curly mesquite

H. cenchroides texana Vasey

RANGE: From centr. Tex. to Ariz. and s. to Centr. Am.

DESCRIPTION: A slender, creeping, stoloniferous perennial with slender, upright, leafy stems 4 to 12 in. high, hairy at the nodes. Leaves narrow, rigid, 2 to 4 in. long, thinly pubescent. Spikes solitary, terminal, slender, 1 to 2 in. long, rather loosely flowered, with 5 to 10 clusters of spikelets; spikelets in clusters of 3, closely sessile at the nodes of the rachis; the central spikelet containing a single pistillate or perfect floret; the lateral spikelets each with 2 or 3 staminate florets.

HABITAT: Dry plains and mesas from 3,000 to 7,000 feet. Does best from 3,500 to 5,500 feet.

FLOWERING PERIOD: Apr. to Oct.

SEED DISSEMINATION: June to Nov.

FORAGE VALUE: One of the most valuable grasses of the dry regions of the Southwest. It withstands close grazing extremely well and long drought better than any other grass, and becomes green soon after each rain. It furnishes excellent winter feed.

Hilaria jamesii (Torr.) Benth. See *Pleuraphis jamesii* Torr.

Hilaria mutica (Buckl.) Benth. See *Pleuraphis mutica* Buckl.

Hierochloe borealis Roem. & Schult. See *Savastana odorata* (L.) Scribn.

Hierochloe odorata (L.) Wahl. See *Savastana odorata* (L.) Scribn.

HOLCUS

A member of *Andropogoneae*, the Beard-grass tribe. It consists of about 3 species, 1 native to s. Mex. and the other 2 native to the Old World, one *H. sorghum* L., is widely cultivated under the name of Sorghum, Cane, Kafir, etc. Annual or perennial grasses with terminal, open or contracted panicles; spikelets in 3's terminating the branchlets of the panicle, the central spikelet 1-flowered, sessile, perfect, the lateral pedicled, staminate; fertile lemma bearing a bent awn.

Holcus halepensis L.

Johnson grass

Sorghum halepense (L.) Pers.

Andropogon halepensis (L.) Brot.

RANGE: A native of s. Europe and Asia now naturalized from N. J. to Fla., Kans., Ariz. and s. Cal., and s. into S. Am.

DESCRIPTION: An erect, smooth perennial with extensively creeping rhizomes. Stems 2 to 5 ft. high. Leaves flat, up to 2 ft. in length, 1-4 to 1 in. wide, long-pointed. Panicle 6 to 10 in. long, somewhat spreading.

HABITAT: Fields and waste places. On the Forests, found along stream beds at rather low elevations.

FLOWERING PERIOD: July and Aug.

SEED DISSEMINATION: Aug. and Sept.

FORAGE VALUE: Produces coarse but palatable forage and if kept grazed it may be used throughout the summer. It makes a good pasture grass and if cut before it goes to seed, it makes a hay relished by stock. In rich, moist, soil, it spreads so rapidly and is so difficult to eradicate when once established that it has come to be greatly feared by the majority of farmers.

Holcus lanatus L. See *Notholcus lanatus* (L.) Nash.

HORDEUM

A member of *Hordeae*, the Barley-Wheat tribe. The genus *Hordeum* is composed of about 16 species, widely distributed in both hemispheres. They are tufted annuals or perennials, with flat leaf-blades and dense, terminal, bristly spikes which break up at maturity, the joints falling with the spikelets attached; spikelets 1-flowered, 3 together at each joint of the rachis, the middle one sessile and perfect, the lateral usually pediceled, often reduced to awns; glumes equal, rigid, usually elongated and awn-like, the 3 pairs forming an apparent involucre around the central, perfect floret; rachilla prolonged behind the palea as an awn, sometimes with a rudimentary floret; lemma of the central floret tapering into an awn. The species of *Hordeum* are generally of medium palatability up to the time when the awns are produced. The awns are injurious to stock, working into the nose and mouth, often penetrating the flesh, and cases are reported where they have caused death. One species, Barley (*H. sativum*) under many varieties has been cultivated since prehistoric times. It is the most important cereal of the far north. The grain is largely fed to horses but the chief use is for brewing beer.

Hordeum boreale Scribn. & Smith

Northern barley

RANGE: From Mont. to s. Alaska and Wash. and s. in the Sierras to e. centr. Cal. and in the Rockies to Colo.

DESCRIPTION: A rather slender, erect perennial with smooth stems 1 to 2 1-2 ft. high. Leaves soft, flat, 4 to 6 in. long, 1-6 to 1-3 in. wide, rough, long-pointed, those of the sterile shoots often over 6 in. long. Spike slender, nodding, 3 to 4 in. long; spikelets 3-5 in. long; glumes about 1-2 to 3-4 in. long; awn-like; lemma of the central spikelet about 2-5 in. long, hairy, pubescent on the margins, bearing a nearly straight awn 1-2 to 1 in. long; the lateral spikelets perfect, staminate or neuter.

HABITAT: Damp soil at medium elevations; up to 10,000 ft. in Colo.

FLOWERING PERIOD: June and July.

SEED DISSEMINATION: July and Aug.

FORAGE VALUE: Furnishes excellent forage when young and is abundant locally.

Hordeum caespitosum Scribn.

Tufted barley

RANGE: From Sask. to w. S. Dak., w. Kans., Utah, Oreg., and Wash.

DESCRIPTION: An erect perennial with stems 2-3 to 2 ft. high. Sheaths and blades smooth, blades 2 to 6 in. long. Spike slender, 1 1-2 to 2 1-2 in. long; lat-

eral spikelets with awns about 1 in. long; central lemma and glumes with awns nearly 1 1-2 in. in length.

HABITAT: Moist, sandy or clay loam soil, in park areas, seldom in the timber.

FLOWERING PERIOD: July and Aug.

SEED DISSEMINATION: Aug. and Sept.

FORAGE VALUE: Palatable and readily grazed by all classes of stock when young. When the awns are produced it loses most of its value as a range plant because of the injury caused by the awns.

***Hordeum gussoneanum* Parl.**

Pacific barley

H. maritimum gussoneanum (Parl.) Richt.

RANGE: A native of Europe. Introduced from Brit. Col. to Idaho and Cal.

DESCRIPTION: A smooth, slender, spreading or ascending annual 4 to 15 in. high. Leaves flat, 1 to 3 in. long, rather broad, slightly pubescent. Spike erect, oblong, 1-2 to 1 1-2 in. long, 1-4 to 2-5 in. wide; glumes bristle-like, about 1-2 in. long; lemma of central spikelet 1-5 in. long, the awn somewhat longer than the glumes.

HABITAT: Fields and waste places.

FLOWERING PERIOD: May to July.

FORAGE VALUE: Palatable to all classes of stock when young, but it produces a small amount of forage. It is often common at lower elevations. The awns cause mechanical injury and accordingly it is of little if any value after fruiting.

***Hordeum jubatum* L.**

Squirrel-tail barley

RANGE: From Ont. to Alaska, Cal., N. Mex., Tex. and Ill. Now naturalized in the East from Lab. and Que. to N. J. and Pa.

DESCRIPTION: A smooth, slender and erect perennial 2-3 to 2 ft. high. Leaves flat, rough and 1 to 5 in. long, 1-12 to 1-5 in. wide. Spike nodding 2 to 4 in. long and about 1 in. wide, soft; lateral pair of spikelets each reduced to 1 to 3 spreading awns; glumes of perfect spikelets awn-like, 1 to 2 1-2 in. long, spreading; lemma 1-4 to 1-3 in. long with an awn as long as the glumes.

HABITAT: Parks, fields and waste places, on moist saline or dry soils.

FLOWERING PERIOD: May to Aug.

SEED DISSEMINATION: June to Oct.

FORAGE VALUE: Variously considered in different parts of the West from no value to excellent forage. In general it may be considered of only medium palatability up to the time the awns are produced and after that it is a pest because of injury caused by the awns.

***Hordeum maritimum gussoneanum* (Parl.) Richt.** See *H. gussoneanum* Parl.

***Hordeum murinum* L.**

Wall barley

RANGE: From Mass. to Md., in the East and from Idaho and Brit. Col. to Lower Cal., Ariz. and s. w. N. Mex.

DESCRIPTION: A rather stout, tufted annual with bushy-branched, spreading stems up to 2 ft. in height. Leaves 1 to 6 in. long, 1-12 to 1-4 in. wide. Spikes 2 to 4 in. long, often partly enclosed by the uppermost, inflated sheath; glumes of the central spikelet narrowly spindle-form, long-hairy on the margins; awn about 1 in. long; glumes of the lateral spikelets unlike, the inner similar to the central, the outer bristle-like, not hairy; lemmas all broad, 1-3 to 2-5 in. long, the awns somewhat exceeding those of the glumes.

HABITAT: Fields and waste places.

FLOWERING PERIOD: Apr. to July.

SEED DISSEMINATION: June to Aug.

FORAGE VALUE: Eaten by all classes of stock before the seed stalks are sent up and if cut before flowering it makes fair hay. After the awns are produced it is disregarded because of the injury caused by them.

***Hordeum nodosum* L.**

Meadow barley

RANGE: From Ind. to Minn., Cal. and Tex. Also in Europe and Asia.

DESCRIPTION: A slender, erect, tufted annual in the South, perennial in the North, with smooth stems 1-2 to 2 ft. high. Leaves 1 1-2 to 5 in. long, 1-24 to 1-4 in. wide, rough. Spike 1 to 3 1-2 in. long, 2-5 to 3-5 in. wide; the lateral spikelets staminate or rudimentary; all the glumes awn-like; lemma unawned.

HABITAT: Moist, sandy to black loam soil along streams or in poorly drained park or meadow areas to elevations of about 8,000 ft. in Mont. and to about 9,500 ft. in Colo.

FLOWERING PERIOD: May to Aug.

SEED DISSEMINATION: July to Sept.

FORAGE VALUE: Valuable for grazing only in the spring of the year, when it is readily eaten by all classes of stock. Upon maturity, which comes early in the season, the awns cause injury.

***Hordeum pammeli* Scribn. & Ball.**

Pammel's barley

RANGE: Ill. to S. Dak. and Wyo.

DESCRIPTION: A perennial with stems erect or bent at base, 2 or 3 ft. tall. Leaves 4 to 8 in. long, 1-6 to 1-3 in. wide, rough. Spike nodding, 3 to 6 in. long, about 1 in. wide, the lateral pair of spikelets nearly sessile, perfect; the middle spikelet 2-flowered or often with the rudiment of a third floret; glume narrowed into slender awns about 1 in. long. This is an intermediate species between *Hordeum* and *Elymus*.

HABITAT: Prairies and plains.

FLOWERING PERIOD: June to Aug.

SEED DISSEMINATION: July to Sept.

FORAGE VALUE: Of only medium palatability even when young and after the awns are produced it becomes a pest.

***Hordeum pusillum* Nutt.**

Little barley

RANGE: Ohio to Idaho, Cal., n. Mex., La., and Tenn. Also sparingly introduced along the coast from Va. to Fla.

DESCRIPTION: A slender, rather rigid, erect, smooth perennial 4 to 15 in. high. Leaves erect, 1-2 to 3 in. long, 1-24 to 1-6 in. wide, smooth beneath, rough above. Spike erect 1 to 3 in. long, 2-5 to 3-5 in. wide, lateral pair of spikelets staminate or rudimentary; the first glume of each and both glumes of the fertile spikelet enlarged above the base and narrowed into slender awns 1-3 to 3-5 in. long; glumes very rough; lemma unawned.

HABITAT: Arid and alkaline soils at low or medium elevations. In Ariz. it extends to elevations of about 7,000 ft.

FLOWERING PERIOD: Apr. to Aug.

SEED DISSEMINATION: June to Sept.

FORAGE VALUE: Of medium palatability to all classes of stock when young and sometimes produces an abundance of foliage but generally occurs only scatteringly on N. F. ranges. After seed maturity it is seldom utilized because of the injury caused by the awns.

HYSTRIX

A member of *Hordeae*, the Barley-Wheat tribe. There are 4 species, 2 in N. Am. They are perennials with unbranched stems, flat leaves and loosely flowered spikes, with spikelets 2 to 4-flowered, on very short pedicels, 1 to 3 together at each joint of the flattened, continuous rachis, facing it as in *Elymus*, widely divergent at maturity; glumes reduced to short or minute awns, the first usually obsolete, both often wanting in the upper spikelets; lemmas convex, rigid, tapering into a long awn.

Hystrix hystrix (L.) Millsp.

Bottle-brush grass

Hystrix patula Moench

Asperella hystrix (L.) Humb.

RANGE: From N. B. to Minn., Nebr., centr. Tex. and Ga.

DESCRIPTION: Stems 2 to 4 ft. high. Leaves spreading, 4 to 8 in. long, 1-3 to 3-5 in. wide, tapering at both ends, rough. Spike barely out of or partly enclosed by the uppermost sheath; 2 1-2 to 5 in. long; spikelets usually far apart, at first erect, soon widely diverging, 2-5 to 3-5 in. long with awns 3-5 to 2 1-2 in. long.

HABITAT: Moist rocky woods.

FLOWERING PERIOD: June to Aug.

SEED DISSEMINATION: July to Sept.

FORAGE VALUE: The stems are too coarse to afford much forage, but the large, broad leaves appear to be palatable.

Hystrix patula Moench. See *Hystrix hystrix* (L.) Millsp.

KOELERIA

A genus of tufted annuals or perennials belonging to the *Aveneae*, although, since they lack the dorsal awn so characteristic of the Oat tribe, some authorities are inclined to include the genus in the *Festuceae*, Fescue-Bluegrass-Brome tribe of the Grass family. The species of *Koeleria* have unbranched stems, slender, flat or inrolled leaf-blades and narrow, mostly spike-like panicles; the spikelets are awnless or extremely short-awned, and 2 to 5-flowered; the glumes are unequal in length and are somewhat shorter than the spikelet. The grain is free.

About 15 species of *Koeleria* have been described; they occur in the temperate regions of both hemispheres.

Koeleria cristata (L.) Pers.

Mountain June-grass

RANGE: From Ont. to Brit. Col. (it does not occur in Alaska) and from Pa. to Nebr., Tex. and Cal.; also nearly throughout Mex. and in Europe and Asia. Has been collected so far on 60 National Forests, representing all 6 Districts.

DESCRIPTION: A perennial bunchgrass, variable in appearance, as would be anticipated from its enormous range. Stems erect, 1 to 2 1-2 ft. high, smooth except typically pubescent just below panicle. Leaves mainly basal and usually numerous, the blades flat or inrolled, 1 to 4 in. long, varying in texture from smooth to rough. Panicle pale green or slightly tinged with purple, shiny, usually contracted, spike-like and tapering at both ends, 1 to 7 in. long. Spikelets 2 to 5-flowered; lemmas shiny. Known also as *Koeleria*, Koeler's-grass and Prairie June-grass.

HABITAT: Dry to moist soils, on prairies and mts., usually at medium elevations. Between 4,000 and 10,000 ft. in Colo. (fid. Rydberg). Experiments made on the Wallowa N. F. showed the species to be of about medium drought-resistance, per-

manent wilting taking place when the soil moisture content was reduced to from 13.6 to 10.0 per cent.

FLOWERING PERIOD: Mainly June to July. July on the Wallowa N. F.

SEED DISSEMINATION: July to Sept. July and Aug. on the Medicine Bow N. F. and middle of Aug. to middle of Sept. on the Wallowa N. F.

REPRODUCTION: Tests made on the Wallowa N. F. indicate that the seed has low viability, the average for all tests being only about 15%, although the tests made in the Y. P. Zone average somewhat higher. The seed crop, however, is usually abundant thus offsetting, to a considerable degree, the low germination.

FORAGE VALUE: All observers attest the value of this grass, although, naturally, some give it higher rank than others. It is one of the commonest and most widely distributed grasses on N. F. ranges and its altitudinal and soil range is also considerable. It is relished, at least in the forepart of the season, by all classes of stock, and, in many localities, is one of the chief constituents of the forage crop. While conceding its local importance it is reported from the Medicine Bow N. F. as of medium palatability only. On the Wallowa N. F. it is stated that "as forage it is hard to name a local species more eagerly eaten. The long, soft, crowded basal leaves are consumed by sheep, cattle and horses in preference to many more abundant forage plants when green. Sheep eat the blades, but not the stalks, after seed maturity. It occurs rather sparingly on higher ranges but furnishes considerable forage on glades and sparsely timbered areas of medium moisture in the Canadian (lodgepole pine) as well as Transition (yellow pine) Zones."

Koeleria cristata pubescens Vasey

Pubescent koeleria

RANGE: Not known with any degree of accuracy. Probably confined to the mountainous districts within the range of the species.

DESCRIPTION: A very pubescent form of the common *Koeleria cristata* (L.) Pers.

HABITAT: In the mountains, usually in the drier sites, and at higher elevations.

FLOWERING PERIOD: More data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: Practically the same as the species.

KORYCARPUS

A member of *Festuceae* the Fescue-Bluegrass-Brome tribe of grasses. There are two species one native to e. N. Am., the other to Japan.

Korycarpus arundinaceus Zea. See *K. diandrus* (Michx.) Kuntze.

Korycarpus diandrus (Michx.) Kuntze

American korycarpus

Diarrhena diandra (Michx.) Wood

K. arundinaceus Zea

RANGE: From Ohio to S. Dak., Tex. and Ga.

DESCRIPTION: A nearly smooth, erect perennial 2 to 3 ft. high. Leaves 8 to 24 in. long, 2-5 to 3-4 in. wide, rough. Panicle few-flowered, 4 to 10 in. long; spikelets 3 to 5-flowered, 1-2 to 2-3 in. long.

HABITAT: Rich, rocky, wooded hillsides.

FLOWERING PERIOD: July and Aug.

SEED DISSEMINATION: Aug. and Sept.

FORAGE VALUE: More data needed.

Lamarckia aurea (L.) Moench. See *Achyrodes aureum* (L.) Kuntze.

LEPTOCHLOA

Leptochloa belongs to the *Chlorideae*, Grama tribe of the Grass family. Members of this genus are mostly annuals (a few species perennial) usually tall, with flat leaf-blades and elongated panicles composed of numerous, very slender spikes, to which the scientific name, Greek *lepto* (slender) and *chloa* (grass) refers. The spikelets are 2 to several-flowered, sessile or nearly so, somewhat flattened, alternating in 2 rows more or less on one side of the spike-axis. The glumes are keeled; the lemmas are keeled, 3-nerved, sharp-pointed and either awnless or short-awned. The palea is shorter than its lemma. The uppermost floret is imperfect or rudimentary.

About 12 species of *Leptochloa* are known, natives of the warmer regions of both hemispheres; about 8 species occur in the U. S., of which only 1 or 2 occur as far n. as N. Y. or Ill., and none occur in Wash. or Oreg.

***Leptochloa dubia* (H. B. K.) Nees**

Sprangle-top

Diplachne dubia (H. B. K.) Scribn.

RANGE: From s. Fla. westw. through extreme s. U. S. to Ariz. Also in Lower Cal. and in the mts. to s. Mex. Apparently absent from Cal.

DESCRIPTION: Stems 12 to 40 in. high from a perennial root, rather stout and somewhat coarse at maturity. Leaves abundant, narrow, tapering to a slender point, 8 to 16 in. long, the sheaths considerably shorter than the internodes. Panicles terminal or from the axils of the leaves, composed of approximately 8 to 10 spikes near together, rather widely spreading and 2 1-2 to 3 1-2 in. long. Spikelets somewhat loose, showing a conspicuous zig-zag structure, often purplish, usually 5 to 8-flowered, but in small forms as few as 2-flowered, 1-5 to 1-3 in. long. Species readily distinguishable by its peculiar lemmas, which are broad, smooth, at least on the lateral nerves, the apex notched and of a thin, papery texture. Known also as Sprangle and Texas Crow-foot.

HABITAT: Usually grows most luxuriantly along creeks, in beds of intermittent streams, along irrigation ditches and the like, but found in a great variety of situations, along roadsides, on rocky hillsides, in arroyos and dry soils of the lower mountains

FLOWERING PERIOD: Mar. to July.

SEED DISSEMINATION: May to Sept.

FORAGE VALUE: An important grass in the arid regions of the Southwest. It has been cultivated in several localities. It furnishes an abundance of leafage and is highly palatable to all classes of stock, at least in the forepart of the season; cattle and horses will graze it later than sheep. Often cut for hay in Texas.

***Leptochloa filiformis* (Lam.) Beauv.**

Red sprangle-top

L. mucronata (Michx.) Kunth

RANGE: From Va. to Fla. and westw. to Ill., Mo., Colo., Ariz. and extreme s. Cal. Also in the West Indies and through Mex. into S. Am.

DESCRIPTION: An annual. Stems smooth, usually somewhat branching, erect or somewhat bent at the base and rooting at the nodes, 1 to 3 ft. high, but sometimes as high as 4 ft. or dwarfish and reduced to about 6 in. Leaf-sheaths hairy, the hairs emanating from papillae or small, rounded bases; leaf-blades numerous, flat, varying from 2 to about 16 in. long and, in texture, from rather soft to rough, from 1-12 to 1-4 in. wide. Inflorescence often 1 ft. or more long, composed of numerous, somewhat feather-like, slender, rigid, usually reddish or purplish spikes, 1 to 6 in. long. Spikelets minute, about 1-12 in. long, 2 to 4-flowered, relatively

distant, that is, scarcely overlapping. Glumes pointed, nearly equaling the 3 or 4 florets in length. Lemmas awnless, smooth or somewhat hairy on the nerves. Also known as Feather-grass and Red rasp-grass.

HABITAT: In dry or moist soils; in open woods among rocks, in irrigated valleys, along railways and riverbanks, on rocky hills, and the like. Often common in rich, cultivated soils.

FLOWERING PERIOD: May to Oct. Reported as about Aug. 15 to Sept. 15 on the Coconino N. F.

SEED DISSEMINATION: June to Nov. Reported to be Sept. on the Coconino N. F.

FORAGE VALUE: More data desired. Reported to be rather scarce and "of little economic value" in N. Mex. On the Coconino N. F. this plant has "rather coarse stems but has succulent foliage which is probably relished by stock." In the Gulf States the species is "common in rich, cultivated ground, and quite showy, but the leaves are so rough and the stems so hard and woody that stock refuse it when grazing, and it has almost no value. Usually regarded as a weed." The species varies so much in abundance as well as in leafiness, succulence and smoothness that its forage value is probably very largely a local matter.

Leptochloa imbricata Thurb.

Close-flowered sprangle-top

Diplachne imbricata (Thurb.) Scribn.

RANGE: La. to s. Cal.; also in Lower Cal. and through Mex. and S. Am. to Argentine Republic.

DESCRIPTION: An annual. Stems rather stout, erect or ascending, smooth, usually somewhat whitish-colored, 1 to 3 ft. high. Leaf-blades usually 6 to 8 in. long; lower blades and sheaths sometimes purplish. Panicle often a grayish-green, composed of numerous, crowded, erect or ascending spikes, 1 1-2 to 2 1-2 in. long, the whole inflorescence sometimes narrow and spike-like. Spikelets 6 to 10-flowered, 1-4 to 1-3 in. long, the florets imbricated (to which the scientific name *imbricata* refers) that is, overlapping somewhat like a fish's scales. Glumes unequal in length, the 1st sharp-tipped, the 2d blunt. Lemmas are somewhat toothed at the broad apex but not awned. Very close to Bearded sprangle-top (*L. fascicularis*) but the panicle more oblong in outline, more compact, with shorter branches and often dark-colored and more exserted, while the spikelets are unawned.

HABITAT: Ditch-banks and other moist sites.

FLOWERING PERIOD: June to Sept.

SEED DISSEMINATION: Aug. to Nov.

FORAGE VALUE: More data needed.

Leptochloa mucronata (Michx.) Kunth. See *L. filiformis* (Lam.) Beauv.

LOLIUM

Lolium is a genus of annuals or short-lived perennials with erect, unbranched stems, flat leaf-blades and scattered spikelets arranged in a terminal spike; it is a member of the *Hordeae*, Barley-Wheat-Rye tribe of the Grass family. The genus differs from *Agropyron* mainly in having the spikelets arranged edgewise, instead of sidewise or flatwise, to the rachis.

The spikelets are flattened, several-flowered, solitary in the alternate notches of the continuous rachis, the glume on the near side wanting except in the topmost spikelet; the glume is narrow, rigid, 5 to 7-nerved, often as long as or longer than the rest of the spikelet but sometimes exceeding the lowest floret only. The

rachilla is flattened. The lemmas are rounded on the back, 5 to 7-nerved, the nerves converging above, awned or awnless; the palea is 2-keeled. The grain is smooth and adherent to the palea.

Six species of *Lolium* are known, natives of Europe, Asia and n. Africa; they are known usually as rye-grasses or ray-grasses but should not be confused with the related genera *Elymus* and *Secale*, the former of which includes our native "rye-grasses," and the latter cultivated rye. Although the genus is a small one, it includes three of the best-known grasses, viz.: The cultivated Italian rye-grass (*L. multiflorum*), Perennial rye-grass (*L. perenne*) and the poisonous Darnel (*L. temulentum*).

***Lolium italicum* A. Br.** See *L. multiflorum* Lam.

***Lolium multiflorum* Lam.**

Italian rye-grass

L. italicum A. Br.

RANGE: A native of s. Europe, where it has long been under cultivation; now widely introduced or adventive in N. Am., especially along the Atlantic and Pacific coasts.

DESCRIPTION: A tufted biennial or short-lived perennial. Stems 1 to 3 ft. high, erect or often somewhat decumbent at the base. Leaf-blades smooth, light green, 4 to 8 in. long, 1-6 to 1-3 in. wide. Spikes 6 to 12 in. long, the stem often roughened below them. Spikelets 20 to 30 in number, 10 to 20-flowered, as much as 1 in. long, or about twice as long as the glume. Lemmas about 1-3 in. long, all, or at least the upper ones, awned, the awns of varying length. Known also as Australian rye-grass, Ray-grass and Bearded lolium.

HABITAT: Roadsides, fields and waste places. On stiff, heavy clays or on very dry soil it does not do well; but on good, calcareous loams or marls or on moist, loamy sands, where the soil is in good condition, it is very productive. It is stated that few, if any, grasses, repay manuring so well.

FLOWERING PERIOD: May to July.

SEED DISSEMINATION: June to Aug.

FORAGE VALUE: A well known and excellent pasture and hay grass. It is a very rapid grower, forming a dense turf and is highly regarded in Europe where it is considered one of the best of the hay grasses. Experiments in artificial range re-seeding conducted by the Forest Service with this species have not, however, been very successful. The grass requires a rich, rather moist soil and does not endure great cold; furthermore, it is short-lived and will not make a permanent pasture.

***Lolium perenne* Linn.**

Perennial rye-grass

RANGE: A native of Europe, w. Asia and n. Africa. Widely naturalized in s. Can. and in the U. S. from Me. to N. C. and w. to Ohio, Tenn., Kans., Ariz. and Cal. Its range is probably spreading year by year. As yet it is rare on the Pacific coast. It is adventive in Mex.

DESCRIPTION: An erect, unbranched, smooth, leafy perennial, 6 in. to 3 ft. high. Leaf-sheaths shorter than internodes; leaf-blades 2 to 5 in. long, 1-12 to 1-6 in. wide. Spike 3 to 10 in. long; spikelets 5 to 12-flowered, mostly 8 to 10-flowered, about 1-2 in. long. Glume strongly nerved and noticeably shorter than the spikelet. Lemmas awnless. Resembles Italian rye-grass (*L. multiflorum*) but usually more delicate, with narrower blades, smaller spikes, the stems and convex surface of the rachis smooth instead of rough, spikelets fewer-flowered and beardless. Known also as Ray-grass and Beardless rye-grass.

HABITAT: Roadsides and waste places, fields, etc. Best adapted to moist, rich loams or clays.

FLOWERING PERIOD: Mar. to July.

SEED DISSEMINATION: June to Sept.

FORAGE VALUE: This grass has been cultivated in England for nearly 300 years and was perhaps the first grass to be cultivated separately for forage purposes. The soil and climate of England seems to be especially adapted to its culture and it is there held to be the first among pasture grasses, holding somewhat the place in that country that timothy does in the U. S. It is a good hay grass in this country where conditions are favorable; it needs a moist climate and heavy soil for its best development. Several varieties are recognized by seedsmen. It is also used for lawns. In N. Mex. Agr. Expt. Sta. Bull. 81 it is reported that this species "has been tried as a pasture grass in a number of places and has done fairly well in the cooler mts. where it had enough water. It does poorly under cultivation in the lower valleys."

***Lolium temulentum* Linn.**

Darnel

RANGE: A native of w. Asia and Europe, now widely distributed in the U. S., rare in the Eastern States but rather common in the Pacific coast States.

DESCRIPTION: An annual, with smooth, erect and usually rather stout stems, 2 to 4 ft. high. Leaf-blades 4 to 10 in. long. Spike stout, erect, 4 to 12 in. long: Spikelets 4 to 8-flowered, 2-5 to 1 in. long. Glume as long as or longer than the rest of the spikelets, firm, pointed, strongly nerved. Lemmas about 1-3 in. long, awned or awnless, the awn, when present, 1-3 in. long or less.

HABITAT: In fields and waste places, often occurring as a weed.

FLOWERING PERIOD: Mar. to June.

SEED DISSEMINATION: May to Aug.

FORAGE VALUE: Perhaps the most famous of poisonous grasses. Its toxic nature was known to the ancients, it being the familiar "tares" of Biblical times. When ground with wheat, (with which it often grows) into flour, it is apt to cause headache and drowsiness. The toxic principle is supposed to reside in a dirty-white, amorphous compound known to chemists as *loliin*; it acts as a narcotic, acrid poison. Swine, as well as certain other animals, are said to be immune to its effects, while rabbits are peculiarly susceptible to its influence. Some investigators are of the opinion that the poisonous properties are due entirely to the presence of a peculiar fungus which is almost invariably found growing in the grain.

***Lophochlaena refracta* Gray.** See *Pleuropogon refractus* (Gray) Benth.

LYCURUS

Lycurus is a member of the *Agrostideae*, Redtop-Timothy tribe of the Grass family. It is a small genus of tufted, erect or ascending perennials with narrow, often convolute leaf-blades and cylindrical, usually densely-flowered, spike-like panicles. The spikelets are 1-flowered and usually in pairs, the lower spikelet of each pair being often sterile. The glumes are 3-nerved, the nerves often produced into awns; lemmas are 3-nerved, awned, broader and longer than the glumes. The grain is inclosed in the lemma and palea but is not adherent to either.

Two or three species of *Lycurus* are known, confined to the Southwestern States and Mex. The name is derived from the Greek *lykos* (wolf) and *oura* (tail) in allusion to the shape of the inflorescence.

Lycurus phleoides H. B. K.

Wolftail

RANGE: From w. Tex. to Ariz. and s., in the mts., to s. Mex.

DESCRIPTION: Usually of a dull, grayish-green color, 8 to 16 in. high, smooth, slender and somewhat wiry, often much branched and bent at the base, stooling considerably. Leaf-blades rather rigid, short, narrow, long-pointed, flat or sometimes folded. Spike slender, cylindrical, crowded, 1 1-5 to 2 2-5 in. long, somewhat more hairy and not quite so large as that of timothy (*Phleum*) to which it bears resemblance as the scientific name *phleoides* indicates. Awns on glumes longer than lemma-awns; 1st glume often bearing 2 unequal awns. Awn of lemma about as long as itself. Known also as Texan timothy.

HABITAT: "Common all over N. Mex." Occasionally on upper plains but more commonly on hillsides, on dry soils or on the rockier mt. sides. Collected under "The Rim" on the Coconino N. F. at 5,600 ft. and, on the Jemez N. F., growing on rocky slopes with Y. P. at 7,000 ft.

FLOWERING PERIOD: Apr. to July.

SEED DISSEMINATION: June to Oct.

FORAGE VALUE: Palatable to all classes of stock, at least before the stems get wiry with age. It is often a common grass in the Southwest and, whenever abundant, is an important part of the forage.

MELICA

Melica is a genus of perennials, often bulbous at the base, with unbranched stems and closed leaf-sheaths, belonging to the *Festuceae*, Fescue-Bluegrass-Brome tribe of the Grass family. The leaf-blades are usually soft and flat. The inflorescence is in the form of usually narrow, sometimes open, panicles. The spikelets are rather large, 2 to several-flowered, often arranged on one side of the rachis; the rachilla is jointed above the glumes and between the florets, extending beyond the fertile florets and characteristically bearing from 1 to 3 sterile florets in the form of empty, club-shaped or hood-shaped lemmas which are convolute about each other. The glumes are large, unequal in length, membranous or papery, 3 to 5-nerved, with thin, dry, whitish or brownish margins. The fertile lemmas are firm, a little larger than the glumes, rounded on the back, 7 to 13-nerved, sometimes awned; like the glumes, their margins also are thin, dry and light-colored. The paleas are 2-keeled, broad, and shorter than the lemmas. The grain is free.

About 30 species of *Melica* are known, distributed in temperate regions of both hemispheres; of these about 18 occur in the U. S., Cal., with 14 species, being the center of distribution.

Melicas are usually known as Melic-grasses, or the bulbous-rooted species, as Onion-grasses. With a few exceptions they occur rather scatteringly on the range, but as a rule the foliage is closely grazed, at least by cattle and horses, and sheep will eat the heads. Several species can be ranked as excellent forage, being among the best of our native range grasses.

Melica aristata Thurber

Bearded melic-grass

RANGE: From Wash. to Cal.

DESCRIPTION: Stems erect or decumbent below, smooth, 2 to 3 ft. high. Not bulbous at base, but the long, fibrous roots often have tuber-like swellings just at the base of the culms or flower-stalks. Leaf-blades numerous, flat, rather broad, somewhat pubescent, 3 to 7 in. long, the leaf-sheaths also pubescent or rough. Panicle narrow, the branches short and erect. Glumes narrow, 5-nerved, 1-2 in.

long; lemmas 5-nerved, rough except on the nerves, 2-toothed at the apex, the fertile ones tipped just below the apex with awns 1-4 to 5-12 in. long.

HABITAT: Dry, open woods, and well-drained slopes and meadows.

FLOWERING PERIOD: Apr. to June.

SEED DISSEMINATION: June to Aug.

FORAGE VALUE: Though somewhat coarse this grass is palatable to all classes of stock, especially in the forepart of the season. In summer and fall cattle and horses continue to graze the whole plant more or less, and sheep will pick off the leaves and eat the seed-heads.

Melica bella Piper

Onion-grass

M. bulbosa Geyer in Hook. Journ. Bot. & Kew Gard. Misc. 8:19, 1856. The first description of this plant, however, under this name is in Vasey's "Grasses of Pacif. Slope, U. S. Dept. Agr. Div. Bot. Bull. 13: No. 63. 1893.

Not *M. bulbosa* Geyer in Thurb. in S. Wats. Bot. Cal. 2: 304. 1880.

RANGE: From Wash. to centr. Cal. and eastw. to w. Mont., Colo. and extreme n. Ariz. With *M. bulbosa* and its near relative, *M. spectabilis*, the most widely distributed *Melica* on N. F. ranges.

DESCRIPTION: Slender, often leafy, erect, 10 to 30 in. high, bulbous at base. Stems solitary or tufted. Sheaths and blades smooth or rough. Panicle narrow, the branches short and erect. Spikelets purplish-tinged, papery with age; glumes broad, the 2d glume 1-3 in. long; lemmas obscurely nerved and awnless. Somewhat variable but its tufted habit distinguishes it from its nearest relatives. A rather ornamental species as the scientific name *bella* "pretty," indicates. Known also as Bulbous melic-grass.

HABITAT: Characteristic of rocky woods, ravines and hills. Found in the Y. P. type in Cal. Reported to occur on the Targhee N. F. in scattering D. F., in aspen-weed types and in well-drained park areas in a sandy loam, it never being the predominating species in any area and never found in wet areas, though it will stand a small degree of shading.

FLOWERING PERIOD: June and July.

SEED DISSEMINATION: Aug. and Sept.

FORAGE VALUE: Usually occurs scatteringly so that it contributes only a small proportion of the forage produced. It is, however, grazed readily by cattle and horses, and sheep are fond of the heads. As the plant varies in leafiness and in abundance its forage value is to a great extent a local matter.

Melica bulbosa Geyer in Thurb. in S. Wats.

Bulbous-rooted melic-grass

Bot. Cal. 2: 304, 1880. Not *M. bulbosa* Geyer in Hook. Journ. Bot. & Kew Gard. Misc. 8: 19. 1856, which is a *nomen nudum* and synonymous with *M. bella*.

M. californica Scribner

RANGE: Wash. to Cal. and eastw. to Mont., Colo., Utah and Nev.

DESCRIPTION: From 2 to 4 ft. high, stems tufted, usually bent at the base and usually somewhat swollen or bulbous; lower sheaths on the older stems persistent, brown and split into numerous fibers; blades somewhat rough, becoming inrolled with age. Panicle narrow almost spike-like, rather densely flowered, 4 to 8 in. long, tawny or purplish, not silvery shining; spikelets about 1-2 in. long, papery,

3 or 4-flowered; 2d glume 1-3 to 1-4 in. long; lemmas rather prominently 7-nerved, awnless.

HABITAT: Mountain meadows and rocky woods.

FLOWERING PERIOD: Mainly June and July.

SEED DISSEMINATION: Mainly Aug. and Sept.

FORAGE VALUE: Usually not abundant in any one place; it is, however, relished by all classes of stock and wherever occurring in appreciable quantity is a valuable constituent of the forage.

Melica californica Scribner. See *M. bulbosa* Geyer.

Melica frutescens Scribn.

Tall melic-grass

RANGE: Confined to Cal. and Lower Cal. Rarer in n. Cal.

DESCRIPTION: Tall, rather stout, tufted, erect, sometimes branching near the base, 2 to 4 or sometimes as much as 6 ft. high, from strong but not bulbous roots; almost woody at the base (as the scientific name *frutescens*, "becoming shrubby," indicates). Often leafy, the blades short, especially on the branches and sterile shoots. Panicle whitish with a sort of silvery lustre, narrow, the branches short and erect; spikelets about 1-2 in. long with 3 or 4 fertile florets; glumes nearly as long as spikelets, prominently 5-nerved; lemmas sharp-pointed but awnless, 7-nerved. Known also as Silvery melic-grass and Shrubby or Woody melic.

HABITAT: In s. Cal., at low elevations, growing in dense clumps. In the mts. it occurs more scatteringly.

FLOWERING PERIOD: Feb. to May.

SEED DISSEMINATION: Apr. to July.

FORAGE VALUE: Reported to be relished, when growing, by all classes of stock.

Melica fugax Boland.

Small onion-grass

RANGE: From Wash. to n. Cal.

DESCRIPTION: Small, slender, rather wiry, erect, usually 6 to 14 in. high, but occasionally as high as 2 ft., smooth or the stems beset with short, stiffish, downward-pointing hairs. Sheaths open at the throat; blades rather long, medium broad and flat. Panicle either narrow or else loose and open, the branches stiffly spreading, few-flowered, 2 to 6 in. long; spikelets about 1-4 in. long, 2 to 5-flowered, usually purple-tinged; glumes broad and papery, the 2d glume nearly twice as long as the 1st glume; lemmas awnless. Grain oblong and curved. Known also as Little melic-grass.

HABITAT: In mt. valleys, open pine woods and dry mt. sides.

FLOWERING PERIOD: Apr. to June.

SEED DISSEMINATION: May to July.

FORAGE VALUE: Highly palatable to all classes of stock. It has been recommended by some authorities for cultivation.

Melica geyeri Munro

Geyer's onion-grass

RANGE: Oreg. to centr. Cal.

DESCRIPTION: Stems 2 to 5 ft. high, bulbous at base, the lower parts often purplish-tinged. Leaf-blades roughish and flat. Panicle open, the lower branches slender and spreading, bearing a few spikelets above the middle. Spikelets narrow, 2 to several-flowered, somewhat purple-stained, 1-2 to 5-6 in. long. Glumes

broad, tapering, smooth, papery, the 2d glume about 1-4 in. long. Lemmas slightly rough, often sharp-pointed but not awned. Known also as Geyer's melic-grass.

HABITAT: In pine woods, along streams and in moist canyons.

FLOWERING PERIOD: More data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: More data needed.

Melica harfordii Boland.

Harford's melic-grass

RANGE: A Pacific species; from Brit. Col. to Monterey Co., Cal.

DESCRIPTION: Stems usually tufted, erect, smooth, slender, rather wiry, often decumbent and sometimes branching below, leafy nearly to the panicle, 2 to 5 ft. high, from coarse, fibrous roots, sometimes from a rootstock; not bulbous at base. Leaf-sheaths smooth, the basal ones often purplish; leaf-blades firm, narrow, flat or inrolled, rough, 5 to 10 in. long. Panicle narrow, the branches erect, 4 to 12 in. long, erect or slightly nodding. Spikelets about 1-2 in. long, light-green or straw-colored but often purple-tinged, 4 to 8-flowered, the florets close and somewhat overlapping. Glumes narrow, blunt, about 1-4 in. long. Lemmas 7-nerved, hairy on the lower margins, either awnless or with a minute awn 1-12 in. long.

HABITAT: In mt. valleys and foothills, open dry woods and slopes. On the Minam N. F. "found only to a limited extent on the higher grass ranges above 6,000 ft. in sandy loam." Collected on a rocky ridge at 7,000 ft. on the Whitman N. F., where it is stated to be "a common grass."

FLOWERING PERIOD: May and June.

SEED DISSEMINATION: July and Aug.

FORAGE VALUE: Good, although sheep do not usually graze it in the latter part of the season when the stems become wiry.

Melica imperfecta Trin.

Small-flowered melic-grass

RANGE: From centr. Cal. (about the latitude of San Francisco) southw. to Lower Cal. Collected also on the Wallowa N. F.

DESCRIPTION: Stems slender, erect, somewhat wiry, 1 to 3 ft. high; not bulbous at base. Leaf-blades narrow and flat. Panicle narrow, from a few in. to 1 ft. in length, the branches in clusters or whorls, long and short together. Spikelets numerous, small, roundish, 1-6 to 1-4 in. long, purple-tinged, usually with only 1 perfect floret and a rudimentary floret. Glumes indistinctly nerved. Fertile lemma a little longer than the glumes, smooth, blunt, indistinctly nerved; rudimentary lemma oblong, sessile or short-pediceled, closely pressed to the palea. A variable species.

HABITAT: Dry, open woods, rocky hillsides and grassy mt. slopes.

FLOWERING PERIOD: Mar. to June.

SEED DISSEMINATION: May to Aug.

FORAGE VALUE: Often common, especially in s. Cal., and very good forage for all classes of stock. The larger forms are considered by experts to be well worthy of cultivation.

Melica parviflora (Porter) Scribn. See *M. porteri* Scribner.

Melica porteri Scribn.

Porter's melic-grass

M. parviflora (Porter) Scribn.

RANGE: From Utah and Colo., through Ariz. and N. Mex., into n. Mex. Also "occasional on bluffs" from Iowa and Nebr. to Tex.

DESCRIPTION: Stems tufted, smooth, erect, slender, unbranched, 12 to 30 in.

high; not bulbous at base. Leaf-sheaths short, overlapping, roughish; leaf-blades numerous, rough, 1-2 to 1-4 in. wide, 5 to 9 in. long. Inflorescence contracted, 5 to 10 in. long, the branches erect; sometimes simple and raceme-like, with only 1 or 2 short, appressed branches. Spikelets few, greenish, narrow, 4 to 6-flowered, about 1-2 in. long, usually nodding on short, bent pedicels. Glumes noticeably shorter than spikelet, the upper glume about 1-3 in. long. Lemmas about 1-3 in. long, the sterile one similar in appearance to the fertile ones and projecting beyond them. Known also as Few-flowered melic-grass.

HABITAT: Cliffs and rocky hillsides. It occurs in Colo. (fid. Rydberg) "especially among bushes, 6,000 to 9,000 ft. Reported from the Tusayan N. F. to be known to occur only at the summit of Bill Williams Mt., about 9,100 ft. elevation, "where there is a considerable amount."

FLOWERING PERIOD: June to Aug. Reported to be Aug. on the Tusayan N. F.

SEED DISSEMINATION: Middle of July to Sept. Reported to be Sept. on the Tusayan N. F.

FORAGE VALUE: More data desired. It is the only *Melica* which occurs in N. Mex., where it is reported to be "moderately common." On the Tusayan N. F. it "is thought to be an excellent forage plant."

***Melica spectabilis* Scribn.**

Showy onion-grass

RANGE: From w. Mont. and Colo. westw. to Wash. and n. Cal.

DESCRIPTION: Stoloniferous, the stolons bearing bulbs which give rise to new plants. Stems 1 to 3 ft. high, slender, often solitary, usually leafy. Leaf-blades roughish and flat. Panicle narrow, usually erect, often spike-like, the branches erect or closely ascending. Spikelets broad, flattened, purple-tinged, 1-3 to 1-2 in. long, 4 or 5-flowered, the pedicels slender, wavy or curving. Glumes broad and papery, shorter than the lowest lemma. Lemmas strongly 7-nerved, blunt and awnless. Known also as Showy melic-grass.

HABITAT: Damp, grassy meadows, rich bottom lands, dry hillsides, etc. Collected at 6,000 ft., in a sandy loam, on the Absaroka N. F. Collected on a sandy soil, at 6,400 ft. on the Deerlodge N. F., where it is stated to occur "both in lightly timbered and dry, open park areas; never the predominating grass in any one area." On the Targhee N. F. collected between 6,000 and 7,000 ft., where it grows "in sandy, deep loam with medium amount of moisture, in meadows along streams or in sage types where moisture is sufficient; never abundant but widely distributed."

FLOWERING PERIOD: May to July. Reported to be latter part of June to early July on the Deerlodge and Targhee National Forests.

SEED DISSEMINATION: July to Sept. Reported to be Aug. on the Deerlodge N. F.

FORAGE VALUE: Good. Reported from the Absaroka N. F. to be "grazed by all classes of stock." On the Deerlodge N. F. stated to be "of scattering growth, the main stem and part of foliage eaten by cattle and horses; sheep take the heads more readily. Due to the sparse amount of vegetation produced and its scattering growth it contributes only a small proportion of the total forage." Termed "a good forage grass" on the Targhee N. F., but the bulbs are "easily trampled or pulled up by sheep when the ground is soft."

***Melica striata* (Michx.) Hitchc.**

Oat-like melic-grass

Avena striata Michx.

Avena torreyi Nash

RANGE: From N. B. and e. Que. to Pa. and westw. to Brit. Col., and southw. in the Rocky Mt. region to n. N. Mex. The w. range of this species is still very im-

perfectly known. There seems to be no record of it as yet in Wash., Oreg., Idaho and Cal.

DESCRIPTION: Very slender, smooth, erect, unbranched, 1 to 2 ft. high. Leaf-sheaths closed to the top, the ligule sheathing the stem; leaf-blades flat, rather broad, 1 to 6 in. long, usually rough above, erect or ascending. Panicle 2 1-2 to 5 in. long, lax, the branches ascending but spreading at the ends. Spikelets 2 to 5-flowered, about 1 in. long, usually somewhat streaked with purple. Glumes only a little longer than the lowest lemmas, somewhat unequal in length; lemmas short-hairy at base, the fertile ones 2-toothed at apex and awned just below the teeth, the awn about as long as the lemma (1-3 in.) or even longer. Similar in appearance to Smith's melic-grass (*M. smithii*) but shorter and more slender with hairy-based lemmas and awns twice as long. Known also as Bearded melic-grass, Canadian melic and Purple oats.

HABITAT: In rocky woods.

FLOWERING PERIOD: Apr. to July.

SEED DISSEMINATION: July and Aug.

FORAGE VALUE: A grass with abundant and tender leafage; very palatable, especially to horses and cattle.

***Melica stricta* Boland.**

Few-flowered melic-grass

RANGE: From Oreg. to Cal. and eastw. through Nev. to e. Utah.

DESCRIPTION: Densely tufted, 6 to 24 in. high, the stems rough, somewhat thickened at base, but not bulbous. Leaf-blades pubescent or rough, 3 to 6 in. long, flat or with the points inrolled and rigid, narrow, erect. Panicle usually erect, open 4 to 6 in. long, composed of 6 to 12 nodding spikelets arranged, for the most part, on the same side of the panicle; branches mostly 1 or 2, closely appressed. Spikelets 2 to 4-flowered, about 1-2 to 3-4 in. long, whitish or purplish, on slender, short, down-curving pedicels. Glumes longer than lowest lemma, nearly as long as spikelet. Lemmas blunt, rough and awnless. Similar to Porter's melic-grass (*M. porteri*) but the panicle much shorter and the spikelets much larger. Known also as Large-flowered melic-grass.

HABITAT: Dry ridges, among rocks, often at subalpine elevations. Usually occurs scatteringly.

FLOWERING PERIOD: Late Mar. to July.

SEED DISSEMINATION: June to Aug.

FORAGE VALUE: More data needed. Probably very palatable, at least in the forepart of the season; produces abundant leafage and, if occurring in sufficient quantity, is doubtless of some importance.

***Melica subulata* (Griseb.) Scribn.**

Alaskan onion-grass

RANGE: Originally known from Alaska, where it grows along the coastal region southw. to centr. Cal. and Wyo. The only species of *Melica* in Alaska.

DESCRIPTION: Stems leafy, slender, bulbous at base and somewhat bent, 2 to 4 ft. high. Panicle narrow, 4 to 8 in. long, the branches closely ascending; spikelets narrow, 3-4 to 1 in. long, loosely 3 to 5-flowered, greenish or sometimes spotted with purple. Glumes narrow, obscurely nerved, the 2d about 1-3 in. long. Lemmas exceeding the glumes, prominently 7-nerved, gradually tapering to an elongated point, the tips so slender as to resemble short awns; keel and lateral nerves somewhat hairy. Known also as Awled onion-grass, Alaskan melic-grass, and Slender-flowered melic.

HABITAT: Meadows, banks, along mt. streams, in damp woods and on shady slopes; in moist soils.

FLOWERING PERIOD: Apr. to early July.

SEED DISSEMINATION: June to Sept.

FORAGE VALUE: Reported to be very palatable to all classes of stock.

Merathrepta spp. See *Danthonia* spp.

MUHLENBERGIA

The genus *Muhlenbergia* is a member of *Agrostideae*, the Redtop-Timothy tribe of grasses. There are approximately 15 annual and 60 perennial species, mostly American and especially abundant on the Mexican plateau.

The genus *Muhlenbergia* is characterized by: 1-flowered spikelets in contracted, or rarely open, panicles; glumes thin, 1-nerved, often awned; lemma with a short, often barbed callus, narrow, membranaceous, 3-nerved, pointed or often awned; the grain is closely enveloped by the lemma.

Most of the species of *Muhlenbergia* are palatable and nutritious and some produce an abundance of foliage. They occasionally occur in sufficient quantity in parts of the Southwest to be important.

Muhlenbergia acuminata Vasey

Pointed muhlenbergia

RANGE: From s. w. N. Mex. to centr. Mex.

DESCRIPTION: A perennial with slender, smooth stems 3 to 4 ft. high, usually unbranched. Leaves inrolled, basal 6 to 12 in. long, the stem ones 3 or 4 in. number, narrow, tapering pointed, rough, the lower 6 to 8 in. long, the upper 1 to 2 in. Panicle linear, 6 to 10 in. long, interrupted, the branches flowering to the base; spikelets 1-6 in. long, glumes 1-2 as long; lemma terminating in a minute awn about 1-12 in. long.

HABITAT: In usually moist, rocky situations of foot hills and mts. at middle elevations.

FLOWERING PERIOD: Aug. More data needed.

SEED DISSEMINATION: Sept. More data needed.

FORAGE VALUE: Owing to its limited distribution no forage notes are available. Officers of the Datil, Gila, and Chiricahua National Forests are requested to make observations of this species whenever practicable.

Muhlenbergia arenicola Buckl.

Sand muhlenbergia

RANGE: Tex. to Ariz. and Chihuahua, Mex.

DESCRIPTION: A perennial with fibrous roots and slender, erect, tufted, unbranched stems 4 to 24 in. high. Leaves mostly short, 1 to 6 in. long, narrow, folded, erect, tapering to a fine point. Panicle terminal, 2 to 8 in. long, slender, but open, sparsely flowered; spikelets about 1-6 in. long; awn of lemma scarcely 1-12 in. long.

HABITAT: On dry mesas and in alluvial draws often in mixture with blue grama.

FLOWERING PERIOD: Aug. and Sept.

SEED DISSEMINATION: Sept.

FORAGE VALUE: Somewhat palatable but the small amount of foliage makes it unimportant.

Muhlenbergia capillaris (Lam.) Trin.

Long-awned muhlenbergia

RANGE: From Mass. to Fla., Tex., s. e. Ariz. and Kans.

DESCRIPTION: A tufted perennial with erect, unbranched, rigid stems 1 1-2 to 4 ft. high. Leaf-sheaths overlapping; blades 4 to 12 in. long, 1-12 to 1-6 in. wide, inrolled and rigid, panicle about 1-3 the entire height of the plant, its slender spreading branches loosely flowered; spikelets on long hair-like branchlets, purple, about 1-6 in. long; the glumes about 1-2 as long as the lemma which bears a delicate awn 1-5 to 4-5 in. long.

HABITAT: Dry sandy or rocky soil.

FLOWERING PERIOD: Aug. and Sept.

SEED DISSEMINATION: Sept. and Oct.

FORAGE VALUE: More data needed.

Muhlenbergia comata Thurb.

Woolly muhlenbergia

RANGE: Mont. to Wash., Cal., n. N. Mex. and Kans.

DESCRIPTION: A perennial with numerous, scaly rhizomes and erect, sometimes spreading stems smooth below, rough above, hairy about the nodes, 1 to 3 ft. high. Leaves rough on both sides, flat, 3 1-2 to 6 in. long, and 1-12 to 1-4 in. wide. Panicle narrow, spike-like, usually somewhat lobed or interrupted, 3 to 6 in. long; lemma about 1-8 in. long, gradually narrowed into a slender awn 1-6 to 1-3 in. long; the basal callus-hairs about as long as the lemma.

HABITAT: Rather moist, broken ground in mountains and foothills.

FLOWERING PERIOD: July to Sept.

SEED DISSEMINATION: Aug. to Oct.

FORAGE VALUE: Very palatable to all classes of stock but not important due to the small amount of forage produced and its limited abundance.

Muhlenbergia cuspidata (Torr.) Rydb.

Plains muhlenbergia

Sporobolus brevifolius (Nutt.) Scribn.

RANGE: From Man. and Alb. to Mo. and N. Mex.

DESCRIPTION: A smooth perennial with erect stems 1-2 to 2 ft. high. Leaves 1 to 4 in. long, less than 1-12 in. wide, erect, inrolled, bristle-like, at least when dry. Panicle 1 1-2 to 5 in. long, slender, the branches close to the main stem, 1-4 to 1 in. long; spikelets 1-10 to 1-8 in. long.

HABITAT: On dry or moist situations in the mountains at middle elevations.

FLOWERING PERIOD: July and Aug.

SEED DISSEMINATION: Aug. and Sept.

FORAGE VALUE: Palatable to all classes of stock and generally quite leafy but seldom very abundant.

Muhlenbergia debilis Trin. See *M. microsperma* (D. C.) Trin.**Muhlenbergia depauperata** Scribn.

Poor muhlenbergia

RANGE: Ariz. and Mex. Possibly parts of N. Mex.

DESCRIPTION: A light green or purplish, densely tufted, much-branched annual 1 to 5 in. high. Leaves rough, flat, or inrolled, 1-2 to 1 1-2 in. long. Panicle erect, narrow, unbranched, 1 to 4 in. long; spikelets erect, stalkless or on short stout pedicels in the notches of the rough, stiff, sharply 3-angled axis or rachis.

HABITAT: In dry or rather moist areas in the mountains.

FLOWERING PERIOD: Aug. and Sept.

SEED DISSEMINATION: Sept. and Oct.

FORAGE VALUE: It is probably palatable but produces such a small amount of foliage, is so short lived, and of such limited occurrence that it is unimportant.

Muhlenbergia distichophylla (Presl) Kunth

Leafy muhlenbergia

RANGE: N. Mex. and e. Ariz., s. on the Pacific slope of Mex.

DESCRIPTION: A leafy perennial with firm stems 2 1-2 to 4 ft. high. Leaves folded, rigid, rough, 1-24 to 1-12 in. wide, the lower about 2-3 as long as the stem; sheaths flattened, smooth. Panicle contracted, 6 to 15 in. long, rather dense, about 1 in. wide, the branches erect; spikelets 1-8 in. long; glumes 1-12 in. long; awns 1-4 to 1-2 in. long.

HABITAT: Rich valley and bottom lands.

FLOWERING PERIOD: June and July.

SEED DISSEMINATION: July and Aug.

FORAGE VALUE: Seldom eaten to any extent by any class of stock on the range because of its coarseness but it is often cut for hay, especially by the Mexicans and Indians.

Muhlenbergia filiculmis Vasey

Slender-stemmed muhlenbergia

RANGE: Colo.

DESCRIPTION: A tufted perennial with slender, weakly erect, smooth stems, 7 to 12 in. high. Leaves basal or nearly so, numerous, inrolled, bristle-like, 1 to 1 1-2 in. long. Panicle narrow, spike-like, 1 to 1 1-2 in. long, each branch with 3 to 5 spikelets; spikelets about 1-12 in. long, the lemma with an awn about 1-24 in. long.

HABITAT: Sandy soil in the mountains.

FLOWERING PERIOD: July to Sept.

SEED DISSEMINATION: Aug. and Sept.

FORAGE VALUE: Somewhat palatable but its scanty leafage and limited distribution make it rather unimportant as a range plant.

Muhlenbergia filiformis (Thurb.) Rydb.

Slender muhlenbergia

Sporobolus filiformis (Thurb.) Rydb.*Sporobolus gracillimus* (Thurb.) Vasey

RANGE: From Wash. to Mont., (centr. Nebr.?) centr. Ariz. and Cal.

DESCRIPTION: An annual or sometimes apparently perennial, rather soft and lax, spreading from a cluster of fibrous roots or with a decumbent, creeping, apparently perennial base. Stems very slender, 1 to 12 in. high, often imperfectly developed. Leaves flat, usually less than 1 in. long. Panicle narrow, interrupted, few-flowered, 1 in. long or less.

HABITAT: In moist soil at medium and high elevations.

FLOWERING PERIOD: Aug. to Oct.

SEED DISSEMINATION: Sept. and Oct.

FORAGE VALUE: Palatable to all classes of stock but generally so small that it is not eaten, except slightly by sheep.

Muhlenbergia gracilis (H. B. K.) Trin.

Mountain muhlenbergia

RANGE: From Wyo. to Cal., and Tex. and s. in the mts. to s. Mex.

DESCRIPTION: A densely tufted perennial from a short decumbent rhizomatous base with slender erect stems 6 to 24 in. high. Leaves crowded at base, narrow, inrolled, rough, sharp-pointed, 3 to 6 in. long. Panicle narrow, loose, 2 to 4 in. long; lemma 1-8 in. long, gradually narrowed into a slender, somewhat flexuous awn 1-2 to 3-4 in. long. Known in the Southwest as Mountain bunchgrass.

HABITAT: On gravelly, rocky or sandy soil at middle elevations; in Colo. to 10,000 feet. In the Southwest it occurs principally in open or normal stands of yellow pine but will not grow in dense shade.

FLOWERING PERIOD: Aug. and Sept.

SEED DISSEMINATION: Sept. and Oct.

FORAGE VALUE: Palatable when young and tender and if kept fairly well grazed it is a valuable forage. It produces an abundance of foliage, is quite resistant to grazing, widely distributed and often fairly abundant.

Muhlenbergia gracillima Torr.

Ring muhlenbergia

RANGE: Kans. and Colo. to Tex. and Ariz.

DESCRIPTION: A densely tufted perennial with slender, smooth, erect, rigid stems 4 to 16 in. high arising from a slender, creeping rootstock. Leaves 1 to 4 in. long, inrolled, rigid, the basal numerous and usually strongly recurved, the 1 to 3 stem leaves erect or ascending. Panicle 2 to 10 in. long, open, the slender branches finally widely spreading, 1 to 3 in. long; lemma tipped with an awn 1-12 to 1-6 in. long. It grows in bunches which die out in the center thus forming a ring of live grass 2 to 3 in. across and 6 to 18 in. in diameter.

HABITAT: On plains, foothills and in the mountains, generally at low elevations but extending up to 10,000 feet.

FLOWERING PERIOD: July and Aug.

SEED DISSEMINATION: Aug.

FORAGE VALUE: Eaten to some extent by all classes of stock but it generally pulls up readily, bringing sand and dirt with it so that it is not relished.

Muhlenbergia jonesii (Vasey) Hitchc.

Jones' muhlenbergia

Sporobolus jonesii Vasey

RANGE: Known only from n. e. Cal.

DESCRIPTION: A perennial with tufted, erect, slender, solid stems about 1 ft. high. Leaves mostly basal, flexuous, rough, 1 to 4 in. long, inrolled, except the lowest, which are flat. Panicle narrow, loose, 2 to 3 in. long; lemmas 1-6 in. long and awn pointed.

HABITAT: In rather dry soils.

FLOWERING PERIOD: More data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: Grazed to some extent, at least by sheep and cattle. More data needed.

Muhlenbergia microsperma (D. C.) Trin.

Small-seeded muhlenbergia

M. debilis Trin.

RANGE: Middle and s. Cal. to Ariz. and s. Mex.

DESCRIPTION: An annual with slender, spreading or ascending stems 4 to 15 in. high. Leaves 1 to 2 in. long, 1-24 in. wide, flat, rough, and often purple. Panicle narrow, loose, 1 to 3 in. long; lemma with a terminal awn about 1-2 in. long.

HABITAT: Open ground.

FLOWERING PERIOD: More data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: Probably somewhat palatable but not important because of its limited distribution and abundance, its short growth period and its small size.

Muhlenbergia monticola Buckl.

Mesa muhlenbergia

RANGE: Tex. to Ariz. and s. in the mts. to centr. Mex.

DESCRIPTION: A slender, wiry, tufted, much branched perennial 1 to 2 ft. high. Leaves numerous, inrolled, 2 to 4 in. long and 1-12 in. wide. Panicle terminal, 2 to 4 in. long, loose, spikelets about 1-6 in. long; lemma with an awn about 2-3 in. long.

HABITAT: Mesas and foothills, in dry, rocky canyons and on cliff ledges, frequently in limestone formations. In rich moist soils.

FLOWERING PERIOD: July to Oct.

SEED DISSEMINATION: Sept. and Oct.

FORAGE VALUE: It is so wiry that stock seldom touch it though it is often abundant and widely distributed.

Muhlenbergia neomexicana Vasey

New Mexican muhlenbergia

RANGE: N. Mex. and Ariz.

DESCRIPTION: An erect perennial with hard, rough, wiry stems, 1 to 2 ft. high and branching near the base. Leaves rough, erect bristle-like, those of the flowering stem 2 1-2 to 4 in. long; those of the sterile shoots about 2-5 in. long. Panicle narrow, thinly spike-like, 4 to 6 in. long, mostly in twos, the branches closely flowered; spikelets about 1-6 in. long; the lemma with an awn about 1-3 to 1-2 in. long.

HABITAT: Rocky hills and mountain sides.

FLOWERING PERIOD: Aug. and Sept.

SEED DISSEMINATION: Sept. and Oct.

FORAGE VALUE: Reported from the Apache N. F. as "appears to be good forage." More data are desired.

Muhlenbergia pauciflora Buckl.

Few-flowered muhlenbergia

RANGE: W. Tex. to Ariz. and Chihuahua.

DESCRIPTION: An erect perennial rather sparingly branched for the entire length, with hard rough stems 1 to 2 ft. high. Leaves rather bristle-like, smooth on the lower side, 2 1-2 to 4 in. long, those near the roots few and short. Panicle spike-like, slender, 2 1-2 to 3 1-2 in. long, the branches mostly single, erect, spikelets about 1-6 in. long; lemma with an awn 1-4 to 1-3 in. long.

HABITAT: Warm south exposures of rocky hills and mountain sides.

FLOWERING PERIOD: Aug. and Sept.

SEED DISSEMINATION: Sept. and Oct.

FORAGE VALUE: Somewhat palatable to all classes of stock and together with other bunchgrasses is valuable for forage.

Muhlenbergia porteri Scribn.

Porter's muhlenbergia

RANGE: Tex. to Colo., Cal. and s. along the Pacific slope to centr. Mex.

DESCRIPTION: A much branched, tufted perennial with slender, somewhat wiry and weak stems 1 to 2 ft. high. Leaves narrow, flat or inrolled, bristle-pointed, 4-5 to 2 in. long. Panicle thin, 2 to 4 in. long, about 10 branches, each bearing 5 to 10 spikelets; spikelets 1-12 to 1-5 in. long; the lemma with an awn 1-8 to 1-4 in. long. Known also as Mesquite grass and Black grama.

HABITAT: Usually under shrubs on dry mesas and foothills. In Ariz. it is found below 5,000 ft. elevation but in Colo. it is found as high as 6,500 feet. It is very drought resistant.

FLOWERING PERIOD: Aug. and Sept.

SEED DISSEMINATION: Sept. and Oct.

FORAGE VALUE: Palatable to all classes of stock and remains green most of the year, but because of its scarcity it is of minor importance. At one time it was important in the Southwest and was cut for hay in large quantities, but has been nearly exterminated in many parts by close grazing.

Muhlenbergia racemosa (Michx.) B. S. P.

Marsh muhlenbergia

RANGE: Nfd. to Brit. Col., e. Oreg., Ariz. and N. J.

DESCRIPTION: A rather stout, erect perennial from very tough and densely scaly rootstocks, with nearly unbranched stems 2 to 3 ft. high. Leaves rough, 2 to 5 in. long, 1-12 to 1-4 in. wide. Panicle 2 to 4 1-2 in. long, dense and spike-like or interrupted at the base; spikelets 1-6 to 1-4 in. long, the long pointed glumes nearly equal and exceeding the abrupt, pointed lemma which is densely bearded at the base.

HABITAT: Moist meadows, swamps, bogs and low ground.

FLOWERING PERIOD: June to Sept.

SEED DISSEMINATION: Aug. to Oct.

FORAGE VALUE: Palatable, and relished by all classes of stock. It is often abundant in parks in the timber and since it grows fast and is closely cropped it is an important forage in many places. In the Northwest it is valued as a hay plant.

Muhlenbergia repens (Presl) Hitchc.

Red muhlenbergia

Sporobolus repens Presl

Sporobolus utilis Torr.

RANGE: Tex. to centr. e. Cal. and s. Mex.

DESCRIPTION: A perennial from a woody creeping rootstock with slender, wiry, widely spreading or creeping stems 3 to 15 in. long. Leaves inrolled, curved, 1-2 to 1 1-2 in. long. Panicle narrow, interrupted, few-flowered, 1-2 to 1 in. long.

HABITAT: On dry deserts or in moist places.

FLOWERING PERIOD: Aug. and Sept.

SEED DISSEMINATION: Sept. and Oct.

FORAGE VALUE: Reported from the Apache N. F. as second rate forage. It is grazed to some extent by all classes of stock and occasionally in moist places is often abundant in a dense sod.

Muhlenbergia richardsonis (Trin.) Rydb.

Richardson's muhlenbergia

Sporobolus richardsonis (Trin.) Merr.

RANGE: From N. B. and Me. to Brit. Col., Oreg., and n. N. Mex.

DESCRIPTION: A tufted perennial from a slender, horizontal rootstock, with erect or ascending stems 4 to 20 in. high. Leaves very narrow, 1-2 to 2 in. long. Panicle usually 1-2 to 2, rarely 4 in. long, narrow, contracted, spike-like; spikelets somewhat crowded 1-8 in. long.

HABITAT: Varies from moist to dry sites. Occurs in meadows, along streams and on prairies.

FLOWERING PERIOD: July and Aug.

SEED DISSEMINATION: Aug. and Sept.

FORAGE VALUE: Palatable to all classes of stock but generally unimportant because of its usual small size and slight amount of forage produced.

Muhlenbergia squarrosa (Trin.) Rydb.

Dwarf muhlenbergia

Sporobolus depauperatus (Torr.) Scribn.

RANGE: Mont. to Wash. and s. in the mts. to s. Mex.

DESCRIPTION: A perennial from numerous hard, creeping, rootstocks with wiry stems erect or decumbent at base, 3 to 24 in. high. Leaves flat or usually in-rolled, 1-2 to 2 in. long. Panicle narrow, interrupted or sometimes rather close and spike-like 1 to 6 in. long; spikelets 1-12 in. long, awnless.

HABITAT: On dry ground in mountains of the South and at low elevations in the North.

FLOWERING PERIOD: Aug. and Sept.

SEED DISSEMINATION: Sept. and Oct.

FORAGE VALUE: While palatable to all classes of stock it usually produces such a small amount of herbage and occurs so scatteringly that it is not important.

Muhlenbergia vaseyana Scribn.

Vasey's muhlenbergia

RANGE: Tex. to Ariz. and s. in the mts. to s. Mex.

DESCRIPTION: A tufted, leafy perennial with stout, erect stems 2 to 3 1-2 ft. high. Leaves flat, rough, tough, 6 to 20 in. long. Panicle 5 to 12 in. long; spikelets about 1-8 in. long; lemmas with an awn about 1-5 to 1-4 in. long. Known locally as Broadleaf bunchgrass.

HABITAT: In warm and rocky situations in brush type at elevations up to 7,000 feet.

FLOWERING PERIOD: July and Aug.

SEED DISSEMINATION: Aug. and Sept.

FORAGE VALUE: Palatable to all classes of stock; produces a large amount of foliage, and is quite common, but grows scatteringly in the brush type usually on rocky, fairly inaccessible cliffs so that it is not of much importance.

Muhlenbergia virescens (H. B. K.) Trin.

Early muhlenbergia

RANGE: Ariz. and w. N. Mex. to centr. Mex.

DESCRIPTION: A densely tufted perennial with erect, rather rigid stems 1-2 to 2 ft. high. Leaves at base 6 to 10 in. long, flat, rough on the margins, or some in-rolled and bristle-like. Panicle 4 to 8 in. long contracted, not dense, erect or drooping, the branches erect, flowering to the base, 1 to 2 in. long; spikelets about 1-6 in. long; lemma with a flexuous awn 2-5 to 3-4 in. long. Known locally as Broadleaf mountain bunchgrass.

HABITAT: In rather open, exposed, rocky sites at elevations of from 6,500 to 9,000 feet.

FLOWERING PERIOD: Apr. to June.

SEED DISSEMINATION: May and June.

FORAGE VALUE: Somewhat palatable, at least to cattle and horses, but because of its lack of abundance it is unimportant.

Muhlenbergia wrightii Vasey

Wright's muhlenbergia

RANGE: From Colo. through Ariz., N. Mex. and w. Tex. to s. Chihuahua, Mex.

DESCRIPTION: A tufted perennial with usually erect stems 1-2 to 2 1-2 ft. high. Leaves narrow, 3 to 6 in. long. Panicle spike-like, cylindrical, densely flowered, more or less interrupted, 1-2 to 3 1-2 in. long. Spikelets about 1-16 in. long, sometimes 2-flowered, glumes and lemma tipped with a very short awn.

HABITAT: Common or poorly drained, rather moist soils throughout the Y. P. and upper woodland types.

FLOWERING PERIOD: Aug. and Sept.

SEED DISSEMINATION: Sept. and Oct.

FORAGE VALUE: Very palatable and readily grazed by all classes of stock. It produces a considerable amount of forage and is rather widely distributed but is never abundant enough to be of very great economic importance.

MUNROA

The genus *Munroa* consists of 3 or 4 annuals of *Festuceae*, the Fescue-Bluegrass-Brome tribe of grasses. One species occurs in N. Am. and the others in S. Am. The genus is characterized by: 2 to 4-flowered spikelets in clusters of 3 to 6, nearly sessile on the axils of the floral leaves; glumes 1-nerved, transparent; lemmas 3-nerved; stigmas finely barbed or short-plumose.

Munroa squarrosa (Nutt.) Torr.

False buffalo-grass

RANGE: N. Dak. and Alb. to Utah, n. Mex. and Tex.

DESCRIPTION: A low, diffusely branching, tufted annual with stems 2 to 8 in. high. Leaves 1-4 to 11-2 in. long, 1-24 to 1-12 in. wide, rigid, rough, sharply pointed.

HABITAT: On dry plains, prairies, mesas and foothills to elevations of 8,500 ft. in Colo.

FLOWERING PERIOD: June to Oct.

SEED DISSEMINATION: July to Nov.

FORAGE VALUE: Rather unpalatable and produces but a small amount of foliage, accordingly of almost no forage value, though it is widely distributed and often abundant. It sometimes tends to become a troublesome weed by taking possession of broken prairie and cultivated fields.

NAZIA

A member of *Zoysieae*, the Korean Lawn grass tribe. There are 2 or 3 species in the tropical and warmer temperate regions of both hemispheres. They are diffusely branching annuals with flat leaves and terminal spike-like inflorescence; spikelets, 1-flowered, in groups of 3 to several at each joint of the main axis, the uppermost in each fascicle sterile; first glume minute or wanting, the second rigid, exceeding the lemma, its back covered with hooked spikes; lemma and palea thin and transparent.

Nazia aliena (Spreng.) Scribn.

Western prickle-grass

RANGE: From Ariz. and s. N. Mex. to Argentina.

DESCRIPTION: Stems 3 to 12 in. high. Leaves 1-2 to 11-2 in. long. Spikes often partly enclosed by the uppermost sheath, 1 to 21-2 in. long.

HABITAT: On ridges and along draws usually in dry, rocky, or sterile soil. In Ariz. to about 5,500 feet.

FLOWERING PERIOD: Aug. and Sept.

SEED DISSEMINATION: Sept. and Oct.

FORAGE VALUE: Usually too small, too short-lived and of too limited abundance to be of any forage value.

Nothololcus lanatus (L.) Nash. See *Nothololcus lanatus* (L.) Nash.

NOTHOLCUS

A member of *Aveneae*, the Oat tribe. About 8 species, natives of the Old World. Annual or perennial grasses with flat leaves and spike-like or open panicles; spikelets falling away at maturity, 2-flowered; lower floret perfect, awnless, upper staminate, awned; glumes thin, about equal, flattened, longer than the florets.

Notholcus lanatus (L.) Nash

Velvet-grass

Holcus lanatus L.

Nothoholcus lanatus (L.) Nash

RANGE: A native of Europe. Introduced from N. S. to Ont., Ill., Tenn. and N. C. and in the West from Cal. to Wash.

DESCRIPTION: A softly and densely pubescent, light green or whitish perennial from a creeping rootstock with erect stems 1 to 2 ft. high. Leaves 1 to 6 in. long, 1-6 to 1-2 in. wide. Panicle purplish, 2 to 4 in. long, narrow; spikelets about 1-6 in. long, nearly as broad; lemmas smooth and shining, the upper bearing a hook-like awn just below the apex.

HABITAT: Fields, meadows and waste places.

FLOWERING PERIOD: May to Aug.

SEED DISSEMINATION: June to Aug.

FORAGE VALUE: Possesses little nutritive value and is not well liked by stock. It possesses some value, however, on peaty or sandy soils where the better grasses will not grow. It has been cultivated occasionally as a meadow grass but its cultivation is not recommended.

Oplismenus zelayensis H. B. K. See *Echinochloa zelayensis* (H. B. K.) Schult.

ORYZOPSIS

Tufted perennials of *Agrostideae*, the Redtop-Timothy tribe. There are about 24 species distributed through temperate and subtropical regions. The genus *Oryzopsis* is characterized by: Spikelets, 1-flowered in narrow or open panicles; glumes rather broad, rounded or abruptly pointed; lemma with a short rounded callus, convolute, somewhat hardened, terminating in a slender usually short awn which falls off at maturity.

The species of *Oryzopsis* are generally palatable and nutritious but seldom occur in sufficient abundance on the range to be important.

Oryzopsis canadensis Torr. See *O. pungens* (Torr.) Hitchc.

Oryzopsis cuspidata (Nutt.) Benth. See *O. hymenoides* (Roem. & Schult.) Ricker.

Oryzopsis exigua Thurb.

Little mountain-rice

RANGE: Mont. to n. Colo., Oreg., and Wash.

DESCRIPTION: Roots fibrous. Stems, densely tufted, slender, 6 to 18 in. high. Leaves slender, rigid, becoming inrolled, the lower almost needle-like, 4 to 8 in. long, the upper leaves 1 to 4 in. long. Panicle narrow, straight, 1 to 2 1-2 in. long, the branches erect and appressed; glumes 1-6 to 1-5 in. long, pubescent; lemma sparsely pubescent; awn twisted below, about 1-6 in. long.

HABITAT: Open woods, among rocks in canyons and on mountain tops at high elevations.

FLOWERING PERIOD: July and Aug.

SEED DISSEMINATION: Sept.

FORAGE VALUE: Palatable and nutritious, especially when young, in spite of the characteristic roughness and wiriness of the leaves. It is seldom abundant and therefore not important.

Oryzopsis fimbriata (H. B. K.) Hemsl.

Pinon mountain-rice

Stipa fimbriata H. B. K.

RANGE: From w. Tex. to s. Ariz. and s. Mex.

DESCRIPTION: Stems slender 1 to 2 1-2 ft. high. Leaves bristle-like, the basal 1 ft. or more in length, the stem leaves shorter. Panicle 3 to 8 in. long, usually partly enclosed at the base by the sheath of the uppermost leaf, the lower branches thread-like, few-flowered near the ends; glumes about 1-4 in. long, smooth; lemma about 1-6 in. long, extremely pubescent; awn 1-2 to 2-3 in. long, smooth.

HABITAT: In scattered tufts, often protected by rocks or spiny shrubs, on rocky hills and in pinon timber.

FLOWERING PERIOD: July and Aug.

SEED DISSEMINATION: Sept.

FORAGE VALUE: One of the most palatable and nutritious grasses in its range; for this reason it is frequently overgrazed and in some localities is being exterminated. It is seldom, if ever, abundant on the range.

Oryzopsis hymenoides (Roem. & Schult.) Ricker

Indian mountain-rice

O. cuspidata (Nutt.) Benth.

Eriocoma cuspidata Nutt.

RANGE: From Man. to N. Mex., Cal. and Brit. Col.

DESCRIPTION: Stems 1 to 2 ft. high. Leaves slender, often nearly as long as the stems, average 8 to 12 inches. Panicle open 3 to 6 in. long, the slender branches in pairs, spreading, the branchlets flexuous, enlarged below the spikelets; glumes about 1-4 in. long, slightly pubescent, papery, narrowed into an awn-like point; lemma about 1-8 in. long, nearly black at maturity, densely hairy with white hairs about 1-8 in. long; awn when present about 1-6 in. long, straight and readily falling off. Known also as Indian millet, Sand-grass and Pinon grass.

HABITAT: Generally in dry, sandy soils but varies from shaded exposures of hills and in canyons to plains and deserts. It generally has a wide altitudinal range; in Colo. extends to about 9,500 feet.

FLOWERING PERIOD: Apr. to July.

SEED DISSEMINATION: May to Sept.

FORAGE VALUE: On dry ranges where it abounds it is good feed for all classes of stock, especially sheep. It thrives on soil too dry and sandy for most other grasses and is often abundant. The seeds are nutritious and are occasionally used for food by the Indians.

Oryzopsis juncea (Michx.) B. S. P. See *O. pungens* (Torr.) Hitchc.

Oryzopsis kingii (Boland.) Beal

King's mountain-rice

Stipa kingii Boland.

RANGE: High Sierra Nevada of e. Cal., possibly centr. s. Oreg.

DESCRIPTION: Stems slender, 8 to 15 in. high. Leaves numerous at the base, inrolled, thread-like. Panicle narrow, loose, the short slender branches appressed

or ascending, few-flowered; glumes broad, papery; lemma about 1-8 in. long, sparingly pubescent awn sickle-shaped, not twisted, about 1-2 in. long.

HABITAT: Alpine parks.

FLOWERING PERIOD: More data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: Palatable to all classes of stock and reported to be one of the most important grasses in alpine parks of a few localities in the high Sierras.

Oryzopsis micrantha (Trin. & Rupr.) Thurb. Small-flowered mountain-rice

RANGE: From Sask. to Nebr., N. Mex., and Ariz.

DESCRIPTION: Stems densely tufted, smooth, slender, erect, 2-3 to 2 1-2 ft. tall. Leaves erect, rough, the basal 6 to 15 in. long, less than 1-24 in. wide and inrolled, the stem leaves 2 to 8 in. long, 1-24 to 1-12 in. wide. Panicle 3 to 6 in. long, the branches spreading after flowering; spikelets 1-12 to 1-10 in. long; glumes and lemma smooth; awn 1-4 to 1-3 in. long.

HABITAT: In its southern range found generally in shade or in protected draws of the juniper type at elevations about 5,500 to 6,500 feet. Further north it grows also on exposed hillsides and extends to about 8,500 feet.

FLOWERING PERIOD: June to Aug.

SEED DISSEMINATION: July to Sept.

FORAGE VALUE: Relished by all classes of stock but generally too limited in abundance to be important. In e. Mont. and w. Dak. it occurs on dry sandy soil, and though tough and wiry it is nutritious and is considered valuable.

Oryzopsis pringlei Beal. See *Stipa pringlei* (Beal) Scribn.

Oryzopsis pungens (Torr.) Hitchc. Slender mountain-rice

O. juncea (Michx.) B. S. P.

O. canadensis Torr.

RANGE: From Lab. to Pa., Mich. and Brit. Col.

DESCRIPTION: Stems densely tufted, slender, smooth, erect, unbranched, 6 to 24 in. tall. Leaves inrolled, bristle-like, the basal usually about 1-2 as long as the stem, occasionally as long, stem leaves 1 to 4 in. long. Panicle 1 to 2 1-2 in. long, the branches 1-2 to 1 in. long, erect or ascending; spikelets 1-8 to 1-6 in. long; lemma pubescent; awn 1-24 to 1-12, rarely 1-5 in. long, sometimes wanting.

HABITAT: Dry, rocky soils and open woodlands.

FLOWERING PERIOD: Apr. to July.

SEED DISSEMINATION: May to Aug.

FORAGE VALUE: Too wiry to be relished by stock.

PANICULARIA

A member of *Festuceae*, the Fescue-Bluegrass-Brome tribe. There are about 15 species, widely distributed in temperate N. Am. and a few in Europe and Asia. The genus *Panicularia* is characterized by: Spikelets few to many-flowered, in narrow or spreading panicles; glumes unequal, short; lemmas convex, firm, with a thin, dry, papery margin, awnless, 5 to 9-nerved. All of the following species are perennial.

As a genus, *Panicularia* is palatable and nutritious and produces a large amount of foliage per plant. Being restricted to wet soil, it does not occur abundantly enough over large areas to be a very important range plant but it is often important as meadow forage at medium or rather high elevations.

Panicularia americana (Torr.) MacM.

American manna-grass

P. grandis (Wats.) Nash*Glyceria grandis* Wats.*Glyceria americana* (Torr.) Frye & Riggs

RANGE: From N. S. to Pa., Tenn., Colo., Nev., Oreg. and s. e. Alaska.

DESCRIPTION: Stems stout, erect, clustered, 3 to 5 ft. high. Leaf-sheaths loose, overlapping, the lower rough; blades flat, 6 to 12 in. or more in length, 1-4 to 2-3 in. wide, usually smooth beneath, rough above. Panicle 8 to 16 in. long, loose and open, nodding at the summit; the branches usually spreading or ascending; spikelets numerous, 4 to 7-flowered, 1-6 to 1-4 in. long; glumes whitish; lemmas purplish. Known also as Reed meadow-grass, Fowl meadow-grass and Tall manna-grass.

HABITAT: Along streams, in moist meadows and moist thickets.

FLOWERING PERIOD: May to July.

SEED DISSEMINATION: June to Aug.

FORAGE VALUE: This plant is relished especially by cattle, though it is eaten by other classes of stock. It is succulent and palatable early in the season, but later tends to become fibrous and unpalatable. It forms a considerable portion of the native hay in moist meadows. While this office is unaware of any case of poisoning being attributed to this plant, it may be stated that the Div. of Poisonous Plant Investigations, reports that minute quantities of hydrocyanic acid have been found in it.

Panicularia borealis Nash

Northern manna-grass

Glyceria borealis (Nash) Batch.

RANGE: From Nfld. to N. Y., Iowa, Colo., n. Ariz., centr. Cal. and s. e. Alaska.

DESCRIPTION: Stems slender, smooth, erect from a creeping base, 1-2 to 5 ft. high. Leaves flat or usually folded, rough above, erect, 4 to 18 in. long, 1-8 to 1-3 in. wide. Panicle partly enclosed by the uppermost sheath, 6 to 20 in. long, narrow, the branches and slender pedicels appressed; spikelets pale, 7 to 13-flowered, 1-2 to 3-4 in. long and 1-24 in. wide.

HABITAT: In damp marshy places.

FLOWERING PERIOD: May to Aug.

SEED DISSEMINATION: June to Sept.

FORAGE VALUE: Palatable but of no economic importance in the West because of its limited abundance.

Panicularia elata Nash

Tall manna-grass

P. nervata elata (Nash) Piper*Glyceria elata* (Nash) Hitchc.

RANGE: From Brit. Col. to Cal., and e. to w. Mont. and n. w. Wyo.

DESCRIPTION: Stems erect, smooth, succulent, 3 to 6 ft. high. Leaf-sheaths rough, loose, blades, flat, rough, 8 to 16 in. long, 1-4 to 2-5 in. wide. Panicle loose and open, 6 to 12 in. long, the branches naked below; spikelets 1-8 to 1-5 in. long, usually 6 to 8-flowered, oblong or egg-shaped-oblong.

HABITAT: Wet meadows, springs and shady moist soil in woods.

FLOWERING PERIOD: July. More data needed.

SEED DISSEMINATION: Aug. More data needed.

FORAGE VALUE: Palatable and nutritious to all classes of stock. It grows in considerable amount on very moist areas and in such places is a valuable component of the forage.

***Panicularia erecta* (Hitche.)**

Erect manna-grass

Glyceria erecta Hitche.

RANGE: From middle e. Cal. and extreme w. Nev. to s. Oreg.

DESCRIPTION: Stems slender, 1 to 2 ft. high, erect from a decumbent base, with creeping rhizomes. Leaf-sheaths smooth, numerous and overlapping at base; blades mostly basal, short and erect, flat, 1-6 to 1-4 in. wide. Panicle narrow, 2 to 3 in. long; the short branches ascending; spikelets oblong, 1-5 to 1-4 in. long, 4 to 6-flowered.

HABITAT: Springy places in mountain meadows.

FLOWERING PERIOD: No data available.

SEED DISSEMINATION: No data available.

FORAGE VALUE: No data available.

Panicularia grandis* (Wats.) Nash** See *P. americana* (Torr.) MacM.Panicularia nervata* (Willd.) Kuntze**

Fowl manna-grass

Glyceria nervata (Willd.) Trin.

RANGE: From Nfd. to Brit. Col., n. Cal., centr. Mex. and Fla. Also in Europe.

DESCRIPTION: Often in large clumps, the stems smooth, slender, erect, 1 to 3 ft. tall. Leaves 6 to 12 in. long, 1-6 to 2-5 in. wide, flat, smooth beneath, rough above. Panicle 3 to 8 in. long, open, the slender thread-like branches ascending, spreading or often drooping, naked below; spikelets purplish, 3 to 7-flowered, 1-12 to 1-8 in. long; glumes minute. Known also as Fowl meadow-grass, Tall meadow-grass and Nerved manna-grass.

HABITAT: Closely confined to moist situations and is able to thrive in rather deep shade, but dies as soon as the water content is reduced to about 15 to 20 per cent. It invariably is associated with sedges and rushes. Occurs over a wide altitudinal range, occurring from medium to high elevations.

FLOWERING PERIOD: May to July.

SEED DISSEMINATION: June to Sept.

REPRODUCTION: Generally good. It produces much seed of high viability.

FORAGE VALUE: Palatable and nutritious to all classes of stock and is most valuable during Aug., as it is then not so succulent as earlier. However, at this time the stems are usually too tough for sheep, but cattle and horses continue to graze the entire plant even to late in the season. It is often abundant and is valuable and important as a meadow grass in many places.

Panicularia nervata elata* (Nash) Piper.** See *Panicularia elata* Nash.Panicularia pauciflora* (Presl) Kuntze**

Few-flowered manna-grass

Glyceria pauciflora Presl

RANGE: From Mont. to Colo., centr. Cal. and s. Alaska.

DESCRIPTION: Stems smooth, rather stout, 1 to 4 ft. high, from a decumbent, rooting base with creeping rhizomes. Leaves scattered, rough, 4 to 12 in. long, 1-4 to 1-2 in. wide. Panicle nodding, 4 to 8 in. long, open, the branches spreading, naked below, rather densely flowered toward the ends; spikelets about 1-6 in. long, oblong, usually 5 or 6-flowered.

HABITAT: Damp soil, wet meadows, swamps, bogs and shallow water. Never in dry, open places. In the Rockies it occurs at medium to rather high elevations.

FLOWERING PERIOD: July and Aug.

SEED DISSEMINATION: Aug. and Sept.

FORAGE VALUE: Palatable to all classes of stock, especially cattle and horses, and produces a large amount of foliage, but its value as a range plant is reduced because of its lack of abundance.

PANICUM

Panicum is by far the largest of all grass genera, about 500 different species being recognized, distributed in the warmer regions of both hemispheres, being most abundant in the tropics and subtropics and relatively very few species occurring in the temperate regions. In Hitchcock & Chase's monograph on North American species of *Panicum*, published in Oct., 1910, 197 species are listed, 158 of which are native to the U. S. The genus is essentially an eastern one, being best developed in the southeastern States, and only a few western species occur, for example: N. Mex. has 16 species; Cal., 14 species; Wash. and Colo., 5 species each, and Mont., 4 species. Fla., with 88 species, is the center of distribution for the U. S., although Tex., on account of its large extent and being the meeting ground for 78 species coming in from various sections, is a close second to Fla.

The genus gives its name to the Millet tribe (*Paniceae*) of the Grass family and to the subfamily *Panicaceae*, it being the type genus of the Millet tribe. Its members are commonly known as Panics, Panic-grasses or Wild millets. They are annual or perennial grasses, varying greatly in habit of growth, foliage and inflorescence; often, too, their aspect varies widely with the season of the year. Most characteristically, perhaps, the leaf-blades are flat, with broad, often heart-shaped, somewhat clasping bases, but this is by no means a constant character. The inflorescence is in the form of open and spreading or narrow and spike-like panicles, or, more rarely, in racemes. The spikelets are either 1-flowered or else have 1 perfect flower and a lower, staminate (male) flower; they are somewhat compressed from front to back, and are jointed below the glumes, so that the entire spikelet falls off together. The glumes are usually very unequal in size, the 1st or lower glume typically not more than 1-2 the length of the spikelet and commonly much shorter, often minute, the 2d or upper glume typically of about the same length as the sterile lemma or so-called "3d glume" above it and which it also greatly resembles in texture. The sterile lemma bears in its axil a thin, membranous, often translucent palea and sometimes also a staminate (male) flower; the fertile lemma is somewhat thickened, typically blunt at the apex, without nerves, the margins inrolled over the inclosed palea, which is of the same texture. The grain is compressed from front to back and is free, although the lemma and palea are firmly closed about it.

To *Panicum* belong a number of well-known farmyard weeds and also European millet (*P. miliaceum*), perhaps the oldest of all cultivated cereals, for evidences of its use have been found in the kitchen middens of the Swiss lake-dwellers of the Stone Age. Several other species of *Panicum* have also been cultivated for grain, but most of the numerous varieties of millet now under cultivation belong to the closely allied genera, *Chaetochloa* and *Echinochloa*.

***Panicum barbipulvinatum* Nash**

Barb-cushioned witch-grass

P. capillare brevifolium Vasey

RANGE: From Minn., Wis., Ill., Kans., and Tex. westw. to Brit Col. and Cal.

DESCRIPTION: An erect annual, 6 to 20 in. high, but usually under 10 in., from fibrous, spreading roots, with 1 or more stems, freely branching from the base, the branches often much shorter than the main stalk and spreading. Leaf-blades

erect or curving and sickle-shaped, 1 1-4 to 6 in. long, varying greatly in width; leaf-sheaths clothed with often purplish, soft or rough hairs, and usually longer than the internodes. Panicles about half the entire plant, rather few-flowered, the branches soon becoming widely spread. In the axils of the branches of the panicle are seen the barbed-hairy "pulvini" or cushions, from which the plant gets its scientific name. First glume about 2-5 the length of spikelet; palea of sterile lemma absent. This is the western equivalent of the well-known Witch-grass (*P. capillare*), from which it differs in its stouter habit, shorter, less pubescent blades crowded toward the base of the plant, and especially in the larger spikelets, which are 1-2 again as long. Known also as Broadleaf sickle-grass, Fuzzy six-weeks, and Tickle-grass.

HABITAT: Open grounds, waste places, cultivated fields, sandy bars of rivers, and the like. Found on "wet and sandy soil at 5,000 to 8,300 ft." in Mont. "A common field and garden weed in cultivated land throughout N. Mex." "At moderate altitudes" in Cal. "Beds of intermittent streams, occurring singly or in small tufts. Woodland type. Altitude, 5,500 to 6,500 ft.", U. S. F. S. District 3.

FLOWERING PERIOD: July and Aug.; given as Aug., U. S. F. S. District 3.

SEED DISSEMINATION: Aug. and Sept.; given as Sept., U. S. F. S. District 3.

FORAGE VALUE: Reported from U. S. F. S. District 3 to be "readily eaten by stock."

***Panicum bulbosum* H. B. K.**

Bulbous panic-grass

RANGE: Ariz. and N. Mex. to s. Mex.

DESCRIPTION: A smooth, stout, erect perennial, 2 to 6 1-2 ft. high, growing in tufts of a few to rather numerous stalks, the bases of the stalks swollen into hard, bulb-like enlargements or "corms." Leaf-blades erect or ascending, flat, 6 to 24 in. long, varying greatly in width, smooth beneath and rough above. Panicles long-exserted from the upper leaf-sheath, varying greatly in length, the slender, wavy branches ascending or somewhat spreading, naked at the base. Spikelets commonly purplish, varying considerably in size. First glume 1-2 to 2-3 as long as the spikelet; 2d glume shorter than the sterile lemma, which occasionally incloses a staminate (male) flower. Also called Alkali Sacaton.

HABITAT: Typically in moist places in canyons and mountain valleys; also found in cultivated fields. Collected at 7,300 ft., on the Tusayan N. F. on an open, rocky ridge. "A common inhabitant of moist mountain canyons to altitudes of 8,000 ft.", Univ. Ariz. Agr. Expt. Sta. Bull. 65, Plate IX. "Fairly common in N. Mex. from 6,000 to 8,000 ft." "There is but little of this grass in centr. Tex. and stockmen do not know much about it."

FLOWERING PERIOD: Mainly July.

SEED DISSEMINATION: About Aug. 15 to Sept. 15.

FORAGE VALUE: Very palatable to all classes of stock during the spring and summer seasons, but later becoming rather coarse and fibrous. It is, however, usually quite limited in occurrence. Though light for its bulk, when cured, it is a valuable hay-grass in several localities.

***Panicum bulbosum sciaphilum* (Rupr.) Hitchc. & Chase**

Small bulbous panic-grass

RANGE: Ariz. and N. Mex. and southw. to centr. Mex. in the Sierra Madre Mts.

DESCRIPTION: Differs from the species in being smaller (1 to 3 ft. high) and in having much narrower leaf-blades and smaller spikelets.

HABITAT: Gravelly river banks, ravines of mesas, and the like. "Generally found on the Coconino N. F. on rocky s. slopes in the Y. P. type. Elevation 7,000 to 8,000 ft."

FLOWERING PERIOD: Given as July on the Coconino N. F.

SEED DISSEMINATION: Given as Aug. on the Coconino N. F.

FORAGE VALUE: Reported from the Coconino N. F. that, "because of its limited occurrence, this species is of very minor importance, though it probably is eaten readily by stock." It is said to be fairly common in some parts of s. N. Mex.

***Panicum capillare brevifolium* Vasey.** See *P. barbipulvinatum* Nash.

***Panicum clandestinum* L.**

Rough-leaved panic-grass

RANGE: From Me. to Fla. and westw. to Mich., Kans. and Tex.

DESCRIPTION: Usually in large, dense clumps, sometimes with short, strong root-stocks, the flower-stalks stout, at first erect, often later becoming leaning; simple at first, later becoming branched, 2 to 5 ft. high. Leaf-blades rough, spreading, 4 to 8 in., long, broad, flat, tapering slightly to the heart-shaped, somewhat clasping bases. Panicles at first inclosed at the base in the upper leaf-sheaths, finally rather long-exserted, 3 to 6 in. long, the flexuous branches widely spreading, in rather distant clusters. Spikelets sparingly pubescent; 1st glume about 1-3 the length of the spikelet; 2d glume slightly shorter than the sterile lemma. Known also as Corn-grass and Deer-tongue grass.

HABITAT: In moist, mainly sandy soils.

FLOWERING PERIOD: Apr. to June.

SEED DISSEMINATION: Mainly June and July.

FORAGE VALUE: More data needed.

***Panicum crus-galli* L.** See *Echinochloa crus-galli* (L.) Beauv.

***Panicum depauperatum* Muhl.**

Starved panic-grass

RANGE: Me. to Minn., and s. to Ga. and Tex.

DESCRIPTION: Perennial, tufted, usually smooth, with slender but stiffish stems, 8 to 16 in. high, erect or spreading at the summit. Leaf-sheaths, except the lowest, shorter than the internodes; leaf-blades narrow, linear or often inrolled on drying, rough on both sides, mainly basal, about 2 to 6 in. long. Panicles roughly oblong in outline, few-flowered and loose, the remote branches ascending; autumnal forms have reduced secondary panicles produced on branches from the lower nodes and somewhat hidden in the tuft of basal leaves. Spikelets, on drying, appear to be beaked; 1st glume 1-3 to 1-2 as long as spikelet; 2d glume and sterile lemma equal in length and longer than the somewhat rounded and minutely beaked grain.

HABITAT: In dry, impoverished soils, commonly in open woods.

FLOWERING PERIOD: Apr. to Aug.

SEED DISSEMINATION: June to Sept.

FORAGE VALUE: Eaten, with at least fair relish, by all classes of stock.

***Panicum hirticaule* Presl**

Rough-stalked panic-grass

RANGE: From s. Cal. to N. Mex. and southw. into Lower Cal. and to s. Mex.; also in the Galapagos Islands.

DESCRIPTION: An erect, usually simple-stemmed annual, 6 to 28 in. high, rough or roughish throughout, especially on the stalks and leaf-sheaths. Leaf-blades flat, usually broad, often with heart-shaped bases. Panicle open, the branches

ascending, not more than 1-3 the length of the entire plant. Spikelets about 1-8 in. long, tapering-pointed, usually reddish-brown; 1st glume 1-2 to 3-4 the length of the spikelet, the upper part of its midnerve rough; 2d glume slightly longer than the sterile lemma, both much longer than the grain; palea of sterile lemma minute. Known also as Red panic.

HABITAT: Rocky or sandy soils; usually in the drier mountains.

FLOWERING PERIOD: More data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: More data needed.

***Panicum lachnanthum* Torr.** See *Valota saccharata* (Buckl.) Chase.

***Panicum obtusum* H. B. K.**

Vine Mesquite-grass

RANGE: From w. Mo., s. Kans., s. Colo., Ariz. and Tex. southw. to s. Mex.

DESCRIPTION: A very peculiar species of *Panicum* with no other species resembling it at all closely except *P. repandum* of Brazil. Perennial, usually tufted, from a somewhat knotted rhizome, from which are produced long, wiry stolons sometimes 8 to 10 ft. long. Stems leafy, unbranched, smooth, wiry, usually decumbent at base, 8 to 32 in. high. Leaf-sheaths shorter than the internodes; leaf-blades usually smooth, firm, erect, usually involute at the tips, 1-12 to 7-25 in. wide and 1 to 8 in. long. Panicle narrow, almost spike-like, 1.2 to 4.8 in. long, the few, densely-flowered, raceme-like branches closely hugging the main axis of the panicle. Spikelets short-stalked, usually brownish, smooth, blunt-pointed, egg-shaped, arranged along one side of the slightly flattened rachis. First glume remarkable in this genus because nearly as long as entire spikelet, 5-nerved; 2d glume and sterile lemma almost equal in length, the sterile lemma subtending a well-developed palea and a staminate flower. Known also as Blunt panic-grass, Grapevine mesquite, Rice-grass, Wire-grass and Vine-grass.

HABITAT: Typically in sandy or gravelly soil, mostly along the banks of rivers, arroyos and irrigation ditches; often in low, damp valleys or shaded by trees and shrubs. Commoner in irrigated lands and in drier soils at lower levels than in the mts., although it grows up to about 6,000 ft. in the n. e. corner of N. Mex. and has been collected at 6,600 ft. on the Tusayan N. F. It is best adapted to a fine, compact soil and requires more than average moisture for the Southwestern region.

FLOWERING PERIOD: May to July.

SEED DISSEMINATION: July to Sept.

FORAGE VALUE: The plant varies considerably in the amount and character of its leafage, which has resulted in rather discrepant reports as to its forage value. In N. Mex. Agr. Expt. Sta. Bull. 81 it is referred to as "not uncommonly a weedy encroacher in pastures and fields; it is not a very good feed, although stock eat it when it is green and tender or when there is nothing better available." In Tex. it is reported that stock do not generally eat it when they can get something else, but that, when it is mixed with other and softer grasses, it has some grazing value. On the other hand, the statement is made that "its appearance and habit of growth indicate an agricultural value of sufficient importance to call for experiments in its cultivation." Further observations concerning this species are needed.

***Panicum pacificum* Hitchc. & Chase**

Pacific panic-grass

RANGE: Brit. Col., Wash., Idaho, Oreg., Nev., Cal. and Ariz. The most common species of *Panicum* in Cal.

DESCRIPTION: A hairy, leafy perennial, 1 to 2 ft. high, or sometimes dwarfed and about 3 to 6 in. high; spring forms: light green in color and mostly upright; autumn forms: prostrate-spreading, often somewhat reddish, repeatedly branching from the upper and middle nodes. Blades erect or ascending, lance-shaped with clasping bases, about 2 to 4 in. long. Panicle rather loose, 2 to 4 in. long, the flexuous branches ascending. Spikelets swollen and pubescent; 1st glume 1-4 to 1-3 the length of spikelet; 2d glume and sterile lemma about as long as the egg-shaped grain when the latter is mature.

HABITAT: Sandy shores and slopes and moist crevices in the rocks. Collected in a sandy loam soil, occurring in "scattering patches found growing around a hot spring, altitude 5,700 ft." on the Payette N. F.

FLOWERING PERIOD: Given as first of July to first of Aug. on the Payette N. F.

SEED DISSEMINATION: Given as middle of July to middle of Sept. on the Payette N. F.

FORAGE VALUE: Reported as "negligible" on the Payette N. F., presumably, at least in part, because of scarcity. Further notes on this species are needed.

Panicum saccharatum Buckl. See *Valota saccharata* (Buckl.) Chase.

Panicum sanguinale L. See *Syntherisma sanguinalis* (L.) Dulac.

Panicum scribnerianum Nash

Scribner's panic-grass

RANGE: Widely distributed, but commonest in the Mississippi River valley and rather rare on the Pacific coast. From Me. to Wash. and from D. C., through Tenn., Ark. and Tex. to Cal. Also in s. Can., across the continent from Ont. westw., but there appears to be no record of its occurrence in Mex.

DESCRIPTION: A perennial, 8 in. to 2 ft. high; spring form: in clumps of few to many stems, usually erect; autumn form: branching from the middle and upper nodes at about the maturity of the primary panicle, the branches longer than the internodes; late in the season: producing crowded branchlets with small, ascending blades, and small, partly inclosed panicles from the upper nodes. Leaf-blades erect or ascending 1-2 in. broad or less, flat, rounded and hairy at the base, usually smooth above and pubescent beneath. Panicles only a little exserted, 1.6 to 3.2 in. long, rarely longer, 2-3 to 3-4 as wide, the flexuous branches ascending. Spikelets swollen, blunt-pointed, egg-shaped, usually sparingly pubescent. First glume about 1-3 the length of the spikelet; 2d glume and sterile lemma nearly equal in length.

HABITAT: Not uncommon in rather dry upland meadows, usually in sandy soils, moist or dry, such as prairies.

FLOWERING PERIOD: May to July (mainly).

SEED DISSEMINATION: June to Sept.

FORAGE VALUE: Very palatable to stock and nutritious as well, but is seldom found in quantities sufficient to be important on N. F. ranges.

Panicum tsugetorum Nash

Hemlock panic-grass

RANGE: A native of n. e. U. S., from Me. to Mich., Ill., Va. and Tenn. Also in Ont.

DESCRIPTION: A perennial, usually of a bluish-green aspect, about 10 to 20 in. high, with flat, thickish, broadly linear leaf-blades, rounded at the base, tapering to a sharp point, usually smooth on the upper side, 1 1-2 to 3 in. long; leaf-sheaths generally pubescent. Panicle often bluish or purplish, spreading, about as long

as the leaf-blades and nearly as broad at the widest part. Spikelets about 1-12 in. long, rounded, studded with short, soft hairs. In autumn and winter the plant tends to become somewhat sprawling.

HABITAT: Usually in dry, sandy soils. The first specimen collected was growing in a forest of Canadian hemlock (*Tsuga canadensis*) whence the scientific name *tsugetorum*.

FLOWERING PERIOD: More data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: More data needed. The leafage, however, is coarse and not particularly abundant and the plant is probably not especially palatable.

***Panicum virgatum* L.**

Switch-grass

RANGE: In Ont. and every State e. of the Mississippi River and westw. from s. Man. and s. Sask. to e. Mont., Wyo., Utah and e. Nev., and southw., through Ariz., N. Mex. and Tex., into centr. Am. as far as Costa Rica. Also found in the Bermudas and the island of Trinidad.

DESCRIPTION: An erect perennial 2 to 7 ft. high, producing numerous, scaly, creeping rootstocks, commonly purple tinged; stems in large to small clumps or even solitary, unbranched, robust, tough and hard. Leaf-sheaths longer than the short lower internodes and usually shorter than the upper internodes, often hairy. Leaf-blades ascending, 4 in. to 2 ft. long, flexible, flat, slightly narrowed toward the base, 1-8 to 3-5 in. wide. Panicles long-exserted from the topmost leaf-sheath, about 6 to 20 in. long, mostly 1-3 to 1-2 as wide, but sometimes contracted and sometimes very open and nearly as wide as long. First glume clasping and 2-3 to 3-4 as long as the spikelet, sharp-pointed. Second glume and sterile lemma both much longer than the grain.

A very variable, although well-marked species; the leaf-blades may be quite hairy, instead of smooth. In marshes it often becomes very luxuriant with panicles 2 ft. long. In n. specimens the panicle is often much dwarfed. Throughout the w. range of the species there is found, chiefly on sandy soil, a form with mostly single or else loosely tufted stems, often decumbent at the base, pale-colored and with small, narrow panicles; there are, however, abundant intergrading forms. The spikelets, too, are frequently affected with a smut, resulting in abnormal forms.

This species is known also as Wild redtop, Black-bent, Wobsqua-grass and Thatch-grass.

HABITAT: Moist or dry soils, most commonly in meadows, along banks of streams, in marshes and on moister prairie lands. In the Southwest this species is usually encountered along banks of creeks, beds of intermittent streams, in moist valleys, canyons, moist uplands and near tanks and pools; it is seldom common in the mountains.

FLOWERING PERIOD: July and Aug.

SEED DISSEMINATION: Aug. and Sept.

FORAGE VALUE: "When young this affords good grazing, but at maturity the stems become hard and practically worthless for fodder. On good lands it is very productive and if cut before the stems have become hard yields a large amount of very good hay."

"Is common and productive in centr. and w. Iowa. It grows abundantly in native prairie sod and along railroads. It is by no means confined to the bottom land or the richer prairie soil, it being frequently found on sandy or gravelly drift, but it affords more and better forage on the richer soil. It is

used for both hay and pasturage, but is much more valuable for hay." It has been limitedly tried under cultivation in centr. Iowa with promising results. In e. Nebr. it is abundant on the prairies, river bottoms and open wooded slopes, having a bluish aspect usually in more w. range in that State. Stock readily eat it there until maturity, after which they will eat the seed heads and pick off the leaves.

In regions where there are artesian wells this grass is reported to have spread rapidly, it being hardy and a strong grower, furnishing a large amount of pasturage.

In Wyo. it is said to be rather rare and to be few-leaved, so that it has very little forage value.

PASPALUM

Perennial grasses of *Paniceae*, the Millet tribe. There are probably 200 species, in the warmer parts of both hemispheres. The genus *Paspalum* is characterized by: spikelets 1-flowered, nearly sessile, placed with the back of the fertile lemma toward the rachis, solitary or in pairs in 2 rows on 1 side of a continuous rachis, forming unbranched, spike-like racemes; racemes 1 to several at the summit of the stem and branches; second glume and sterile lemma membranaceous, about as long as the hardened fertile lemma.

The species of *Paspalum*, generally are palatable and nutritious and furnish good range forage and especially good hay.

Paspalum distichum L.

Knot-grass

RANGE: Va. to Fla., Mo. and N. Mex. in the East, and from s. w. Wash. to Cal. in the West. It also occurs in the West Indies and extends through Mex. to S. Am.

DESCRIPTION: Stems erect from a decumbent, rooting base, with numerous creeping rhizomes, smooth or the nodes pubescent 1-2 to 2 ft. high. Leaves flat, smooth, rarely pubescent, 2 to 4 in. long. Racemes 2, the second usually about 1-3 to 2-5 in. below the first, sometimes a third below the second, slender, ascending or appressed, usually 1 to 2 in. long; spikelets about 1-8 in. long. Known also as Joint-grass.

HABITAT: On the seashore, in ditches, along streams and in wet places generally, usually in sandy soils.

FLOWERING PERIOD: Apr. to Oct.

SEED DISSEMINATION: May to Oct.

FORAGE VALUE: The somewhat succulent stems and tender leaves furnish excellent grazing. It is also of value for holding banks of streams which are subject to erosion.

Paspalum stramineum Nash

Straw-colored paspalum

RANGE: Nebr. to Mo. and Tex. Also in n. Mex.

DESCRIPTION: Stems tufted, branching, spreading or prostrate 8 in. to 3 ft. tall. Leaves about 4 in. long, crinkly on the hairy margin, finely pubescent, often with a few scattered, long hairs. Racemes 1 to 3, mostly 2, in number, 1 1-2 to 4 in. long; spikelets straw-colored, about 1-12 in. in diameter, globular, smooth.

HABITAT: Dry sandy soil.

FLOWERING PERIOD: July and Aug.

SEED DISSEMINATION: Aug. and Sept.

FORAGE VALUE: Information regarding the forage value of this species is scanty. It is reported to be worthless as forage on the Kansas N. F. More data desired.

PHALARIS

A member of *Phalarideae*, the Canary-grass tribe. There are about 10 species, mostly natives of s. Europe. They are annuals or perennials with flat leaves and dense spike-like panicles; spikelets with 1 perfect flower, laterally flattened; glumes equal, boat-shaped, exceeding the florets; sterile lemmas 2, small and narrow, appearing like hairy scales attached to the fertile floret; fertile lemma, hardened and shining in fruit, enclosing a faintly 2-nerved palea.

The species of *Phalaris* are generally palatable and nutritious and produce a large amount of foliage, but on the western ranges they occur so sparingly that they are of no importance.

Phalaris amethystina (Trin. misapplied by) American authors; not true
P. amethystina Trin. See *P. californica* H. & A.

Phalaris arundinacea L.

Reed canary-grass

RANGE: N. S. to N. J., Colo., centr. Cal. and Brit. Col. Also in Europe and Asia.

DESCRIPTION: An erect perennial 2 to 5 ft. high, from creeping rhizomes. Leaves 3 to 10 in. long, and 1-4 to 2-3 in. wide. Panicle 3 to 7 in. long, narrow, the branches densely flowered, spreading when in flower, erect later, the lower as much as 2 in. long; spikelets 1-6 to 1-4 in. long.

HABITAT: Thrives best on stiff, wet land and on wet, flooded fields, but will grow on rather dry, sandy soil and is little affected by drought or cold.

FLOWERING PERIOD: June to Sept.

SEED DISSEMINATION: July to Oct.

FORAGE VALUE: This grass is rather coarse as forage, but makes good hay and ensilage if cut before the seed heads mature; it gets too woody afterwards. It is a valuable grass for binding ditch-banks, river banks, and the like. It is occasionally cultivated as a pasture grass and the seed is handled by most seed-houses. The ornamental "ribbon-grass" so extensively grown for its alternately green-and-white striped leaves is a cultivated variety of this species.

Phalaris californica H. & A.

California canary-grass

P. amethystina of American authors, not Trin.

RANGE: Centr., w. Cal., from Mendocino Co. to San Luis Obispo Co.

DESCRIPTION: A tufted perennial with stems erect or somewhat bent at the base, 2 to 8 ft. high. Leaves short, the upper 1 in. or less in length, 1-4 to 1-2 in. wide. Panicle spike-like, egg-shaped or oblong, 1 to 2 in. long, 3-4 to 1 in. thick, often purplish tinged; glumes about 1-4 to nearly 1-3 in. long, narrow, smooth or slightly rough on the keel.

HABITAT: Ravines and open ground.

FLOWERING PERIOD: June.

SEED DISSEMINATION: No data available.

FORAGE VALUE: No data available.

Phalaris canariensis L.

Canary-grass

RANGE: A native of the Mediterranean region. Now introduced from N. S. to Va., Mont., Colo., and Tex. and from Wash. to Cal. Also in parts of Mex.

DESCRIPTION: An annual with erect stems, 1 to 3 ft. high. Leaves 2 to 12 in. long, 1-6 to 1-2 in. wide, strongly roughened. Panicle dense and compact, egg-

shaped to oblong, 1-2 to 1 1-2 in. long; spikelets 1-4 to 1-3 in. long; glumes conspicuously striped, broadly winged on the keel; sterile lemmas in pairs.

HABITAT: Escaped from cultivation into waste places and along roadsides.

FLOWERING PERIOD: June and July.

SEED DISSEMINATION: July and Aug.

FORAGE VALUE: It is cultivated in Germany and s. Europe and is occasionally cultivated for its seeds in this country.

Phalaris minor Retz

Small canary-grass

RANGE: A native of the Mediterranean region, naturalized in the West from n. centr. to s. Cal. and in the East has been collected in N. B. and N. J.

DESCRIPTION: An annual with erect, leafy, much-branched stems, 1 to 3 ft. high. Leaves 4 to 12 in. long, 1-3 to 2-3 in. wide. Panicle dense and compact, egg-shaped or oblong, 1-2 to 2 in. long; glumes 1-6 to 1-4 in. long, strongly winged on the keel, the green stripe less conspicuous than in *P. canariensis*; sterile lemma solitary.

HABITAT: Near the coast, escaped from cultivation.

FLOWERING PERIOD: No data available.

SEED DISSEMINATION: No data available.

FORAGE VALUE: No data available.

PHLEUM

Perennial grasses of *Agrostideae*, the Redtop-Timothy tribe. There are about 10 species in the temperate and cool regions of the world, 1 a native of America. The genus *Phleum* is characterized by: Spikelets 1-flowered, flattened, in dense cylindrical, spike-like panicles; glumes unequal, hairy on the keels, abruptly awn-pointed; lemma shorter than the glumes, square at the end, transparent; leaves flat.

Phleum alpinum L.

Alpine timothy

RANGE: Lab. to Alaska, s. to the mts. of N. H. and Vt., to upper Mich. and, in the mts. of the West, through N. Mex., Ariz., and Cal. to extreme s. S. Am. Also in n. Europe and Asia. It is one of the most widely distributed grasses of N. F. ranges and has been submitted from 52 National Forests representing all 6 districts.

DESCRIPTION: Stems 8 in. to 2 ft. high from a decumbent somewhat creeping base. Leaves 2 to 6 in. long, 1-12 to 1-3 in. wide. Spike-like panicle, oblong to cylindrical 1-2 to 2 in. long, 1-4 to 1-2 in. in diameter, awns of glumes 1-12 in long, giving the head a bristly appearance.

HABITAT: Marshes, swales, moist meadows, around springs and along stream banks. It requires a great deal of moisture and usually wilts when the water content of the soil is reduced to about 15 per cent.

FLOWERING PERIOD: June to Sept.

SEED DISSEMINATION: Aug. to Oct.

REPRODUCTION: Produces a moderate amount of seed of high viability.

FORAGE VALUE: Relished by all classes of stock. It usually produces a fair amount of nutritious foliage which remains green and tender till very late in the season and accordingly it is a valuable late sheep feed. It is widely distributed in mountain meadows, usually in scattering stands, though often abundant. Considered one of the 5 most important grasses in District 2.

Phleum pratense L.

Timothy

RANGE: A native of the Mediterranean region. Now widely cultivated and naturalized throughout the U. S., s. Can. and s. e. Alaska.

DESCRIPTION: Stems tufted, from a swollen or bulb-like base, erect, usually from 2 to 4 ft. high, though at high altitudes and in poor soil they are often 1 ft. or less, and under exceptionally favorable conditions have been known to reach a height of 6 feet. Leaves 3 to 9 in. long, 1-6 to 1-4 in. wide; spike-like panicle cylindrical, 1 to 7 in. long and 1-5 to 1-3 in. in diameter; awn of glumes 1-24 in. long.

HABITAT: It will grow under widely varied conditions of altitude, moisture, soil, etc., but thrives best in well drained but moist clay or loam soils of medium elevations.

FLOWERING PERIOD: July and Aug.

SEED DISSEMINATION: Aug. and Sept.

FORAGE VALUE: It is usually regarded as one of the foremost forage plants of the U. S. and is held in world wide high esteem. It produces an abundance of extremely nutritious foliage which is greatly relished by all classes of stock. It is extensively cultivated in all parts of the U. S. as a pasture grass and for hay. Out of 87 range reseeding experiments with timothy about 65 per cent were successful, showing by far the best results of any species tried. As a result of the reseeding and of cultivation in the mountain region and because of the ability of timothy to withstand grazing it is increasing on the western ranges.

PHRAGMITES

A member of *Festuceae*, the Fescue-Bluegrass-Brome tribe. There are 3 known species, 1 in Asia, 1 in S. Am. and the other of the North temperate zone. They are tall reed-like perennials with broad, flat leaves and large terminal panicles; spikelets loosely 3 to 7-flowered; glumes unequal, shorter than the spikelet; rachilla clothed with long silky hairs; lemmas narrow, smooth, the lowest equaling the uppermost florets, empty or staminate.

Phragmites communis Trin. See *P. phragmites* (L.) Karst.

Phragmites phragmites (L.) Karst.

Common reed-grass

P. communis Trin.

P. vulgaris (Lam.) B. S. P.

RANGE: Throughout U. S. and Mex. and extending n. to N. S., Man., and Brit. Col. Also in Europe and Asia.

DESCRIPTION: Stems 5 to 15 ft. high from long, creeping rhizomes, these sometimes appearing on the ground as long, leafy stolons as much as 30 ft. long. Leaves as much as 2 in. wide, and 6 to 12 in. long. Panicle 6 to 15 in. long; spikelets about 1-2 in. long.

HABITAT: In swamps and wet places. To elevations of about 6,500 ft. in centr. Utah and to about 8,000 ft. in Ariz.

FLOWERING PERIOD: Aug. More data desired.

SEED DISSEMINATION: Rarely ripens seed.

FORAGE VALUE: Cattle graze the young shoots but it soon becomes too coarse to be of any value for forage. It is useful as a soil binder on soils subject to washing and the mature stems make the best of thatch.

Phragmites vulgaris (Lam.) B. S. P. See *P. phragmites* (L.) Karst.

PLEURAPHIS

A member of *Zoysieae*, the Korean Lawn grass tribe. There are 3 species in dry and semi-desert regions of s. w. U. S. and n. Mex. They are perennial, wiry or woody grasses with creeping rhizomes but not stoloniferous; terminal spikes; spikelets in 3's at each joint of the rachis, hairy at base, all sessile and falling off together; central spikelet 1-flowered, perfect, with 2 glumes, their summit cleft into several awn-like divisions; lateral spikelets staminate and 1 or 2-flowered.

Pleuraphis jamesii Torr.

Galleta-grass

Hilaria jamesii (Torr.) Benth.

RANGE: From Wyo. to extreme w. Tex., centr. e. Cal. (Inyo Co.) and Nev.

DESCRIPTION: Stems smooth, the nodes hairy, 12 to 20 in. high. Leaves mostly 1 to 2 in. long, though under favorable conditions longer, 1-12 to 1-6 in. wide, rigid, early becoming inrolled, the upper reduced. Spike erect, 2 to 3 1-2 in. long, often purplish; spikelets 1-4 to 1-3 in. long, hairs at the base about 1-8 in. long; lemmas and glumes all short-awned with plumose awns except the second glume of each lateral spikelet which is awnless. Known locally as Black grama.

HABITAT: Mesas, table lands and deserts. Varies from dry to moist situations and in the Southwest is common in the lower limits of the Y. P. type, from 5,000 to 7,000 ft., associated with blue grama.

FLOWERING PERIOD: Mar. to July.

SEED DISSEMINATION: Apr. to Aug.

FORAGE VALUE: Highly palatable and nutritious to all classes of stock. It produces a great deal of foliage and often occurs rather abundantly over large areas. Its creeping roots make it unusually resistant to trampling and it withstands drought exceptionally well. In many places in the Southwest it produces a large part of the forage.

Pleuraphis mutica Buckl.

Tobosa-grass

Hilaria mutica (Buckl.) Benth.

RANGE: From w. Tex. to Ariz. and n. Mex.; "reported from Colo. but doubtful."

DESCRIPTION: Resembles *P. jamesii* but differs chiefly in that its stems are smooth; spikes white or straw colored; spikelets about 1-4 in. long, the hairs at the base 1-12 in. long. Known locally as Black grama.

HABITAT: Common on plains and to some extent in foothills at the lower elevations, in southern Ariz. it is characteristic of clay soils in swales and other depressions. In the mountains it is a bunchgrass, forming tufts, 6 to 12 ft. across. In N. Mex. it is stated to occur usually in fine, compact, or sometimes in loose, sandy soils, that are flooded in the rainy season, frequently growing in practically pure stands all the way up to 1 or 2 acres in extent. It withstands drought and floods with equal hardiness.

FLOWERING PERIOD: Apr. to Aug.

SEED DISSEMINATION: June to Oct.

FORAGE VALUE: Considered one of the most important grasses of the Llanos Estacados (Staked Plains). It is, however, coarser, drier and tougher than Galleta-grass (*P. jamesii*). Its growing season follows immediately the coming of the summer rains when it is eagerly sought out by cattle and horses. It is reported to be very nutritious and fattening. When dry, however, it is worthless or practically so. It withstands trampling remarkably well, which makes it especially valuable on the loose soils which it inhabits.

PLEUROPOGON

A member of *Festuceae*, the Fescue-Bluegrass-Brome tribe. There are 3 species, 2 in U. S. and 1 in the Arctic regions. They are soft annuals or perennials with flat leaf-blades and rather large, many-flowered spikelets in loose racemes; glumes unequal, membranaceous and nearly transparent, shorter than the lemmas; lemmas membranaceous, 7-nerved, the mid-nerve extending into a short point or awn; palea 2-keeled, the keels winged.

Pleuropogon refractus (Gray) Benth.

Nodding pleuropogon

Lophochlaena refracta Gray

RANGE: From Wash. to n. w. Cal.

DESCRIPTION: A perennial, with stems 3 to 5 ft. high. Leaves of stem 3 or 4 in number, rough above, lower 6 to 10 in. long, 1-6 to 1-3 in. wide, the upper 1 to 2 in. long. Raceme 6 to 8 in. long with 6 to 10 spikelets pendant on slender, spreading or reflexed pedicels 1-12 to 1-6 in. long; spikelets about 1 in. long, linear oblong, 8 to 12-flowered.

HABITAT: Cold, damp bogs, wet meadows and along mountain streams at elevations of from 3,500 to 11,500 feet.

FLOWERING PERIOD: May to Aug.

SEED DISSEMINATION: July to Sept.

FORAGE VALUE: Palatable to cattle and horses but seldom abundant enough to be important as forage.

POA

The genus *Poa* is a member of the largest main division of the Grass family, the *Festuceae* or Fescue-Bluegrass-Brome tribe. There are approximately 150 species of *Poa* widely distributed in all temperate and cold regions. North America is represented by approximately 3 annual and 75 perennial species.

They are tufted or stoloniferous grasses with flat, folded, or inrolled leaves and contracted or open panicles. Spikelets are 2 to several-flowered, the uppermost floret rudimentary; glumes keeled, 1 to 3-nerved; lemmas herbaceous or membranaceous, keeled, awnless, 5-nerved, the intermediate nerves sometimes obscure, the floret sometimes with cobwebby hairs at base.

With very few exceptions the species of *Poa*, or the bluegrasses as they are here called, are palatable and nutritious and are often the most important grasses in many parts of the West. Some are of especially high value in hay meadows. In England the members of this genus are generally known as meadow-grasses and they have also been called spear-grasses in this country.

Poa alcea Piper

Pacific bluegrass

RANGE: From middle Cal. to Oreg.

DESCRIPTION: A tufted perennial with slender stems 1 1-2 to 3 ft. high, loose and decumbent at the base. Leaves flat, rather soft and more or less rough. Panicle loose and open, the branches 1 to 2 in. long, ascending; spikelets 1-4 to 1-3 in. long.

HABITAT: Wet, usually rocky sites.

FLOWERING PERIOD: July; more data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: Probably quite palatable to all classes of stock but generally not abundant enough to be of any economic value.

Poa alpicola Nash

Mountain blue-grass

P. laxa Haenke as to its w. range.

RANGE: Owing to nomenclatorial differences the range of this species is somewhat in dispute. It is now regarded, however, by the best authorities as the western equivalent of the Eastern, European and Asiatic wavy meadow-grass (*P. laxa* Haenke), which ranges in N. Am. from N. E. and n. N. Y. into e. Can. and Greenl. This species may be considered as ranging from Colo. and Utah n. in the mts. to Alaska.

DESCRIPTION: A loosely tufted, smooth perennial 4 to 16 in. high. Leaves narrow and about 1 to 3 in. long. Panicle 1 to 3 in. long, loosely flowered, the slender branches erect or ascending; spikelets 2 to 4-flowered and about 1-5 in. long.

HABITAT: In wet alpine situations.

FLOWERING PERIOD: July and Aug.

SEED DISSEMINATION: Aug.

FORAGE VALUE: Palatable and nutritious to all classes of stock but is generally unimportant because of the small amount of foliage produced.

Poa alpina L.

Alpine bluegrass

RANGE: From Lab. and Que. to Alaska and Wash. and s. through the Rocky Mts. to Colo. and Utah. Also in Europe and Asia.

DESCRIPTION: A tufted perennial from a stout root base with erect, rather stout stems 2 to 18 in. high. Leaves mainly basal, 1-8 to 1-4 in. wide and 1 to 3 in. long. Panicle 1 to 3 in. long, the very slender branches spreading; spikelets rather crowded, broadly egg shaped, 3 to 6-flowered and 1-5 to 1-4 in. long.

HABITAT: In wet alpine situations, along streams and open mountain slopes, though its elaborate root system enables it to grow on sites subject to considerable fluctuation in soil moisture. In Colo. it occurs at elevations of 9,000 to 13,000 ft.

FLOWERING PERIOD: June to Aug.

SEED DISSEMINATION: Aug. and Sept.

FORAGE VALUE: Very palatable and nutritious to all classes of stock. Often abundant at high altitudes. It is considered the most important grass in District 2.

Poa ampla Merrill

Ample bluegrass

RANGE: Not yet known with precision. Now known to occur from Brit. Col. to e. Oreg., n. and w. Wyo. and s. w. Mont.

DESCRIPTION: A rather stout, erect, smooth, perennial 1 1-2 to 5 ft. high, from very stout rootstocks. Leaves flat, rarely inrolled, smooth below, rough above, the stem leaves 6 to 10 in. long. Panicle interrupted, about 1 in. in diameter and 3 to 7 in. long, the branches, erect or ascending and spikelet bearing throughout; spikelets about 1-3 in. long and usually 3-flowered.

HABITAT: In rather dry situations.

FLOWERING PERIOD: July and Aug.

SEED DISSEMINATION: Aug. and Sept.

FORAGE VALUE: Probably a valuable forage plant; more data needed.

Poa annua L.

Annual bluegrass

RANGE: A native of Europe and Asia but now widely naturalized from Lab. and Alaska to Ga., Cal. and southern Mex.

DESCRIPTION: A low, spreading annual with flattened stems, 2 to 12 in. high and usually decumbent at base, sometimes rooting at the lower nodes. Leaf-sheaths

loose, the blades soft and lax. Panicle open, 1 to 3 in. long; spikelets 3 to 6-flowered and about 1-6 in. long. It is also called Low spear-grass.

HABITAT: Common in dooryards, lawns, walks, along roadsides, fields, and waste places to 11,500 feet. In cultivated fields it is regarded as a pest.

FLOWERING PERIOD: Apr. to Oct.

SEED DISSEMINATION: June to Nov.

REPRODUCTION: A very prolific seeder and often spreads freely by the rooting of the decumbent stems.

FORAGE VALUE: Palatable to all classes of stock but of little value because of the small amount of forage produced and its local distribution.

***Poa arctica* R. Br.**

Arctic bluegrass

RANGE: From Lab. to Alaska, south in the Mts. to Wash. and n. N. Mex. Also in Siberia.

DESCRIPTION: A slender, densely tufted, smooth and erect perennial 4 to 24 in. high, with narrow leaves 1 to 4 in. long. Panicle 1 to 4 in. long, open, the slender branches generally widely spreading and bearing 2 to 3 spikelets toward the ends; spikelets 2 to 5-flowered and about 1-6 to 1-3 in. long.

HABITAT: It prefers moist, rich slopes or creek bottoms in arctic and alpine situations. Occurs in Colo. at elevations of 11,000 to 14,000 feet.

FLOWERING PERIOD: July and Aug.

SEED DISSEMINATION: Aug. and Sept.

FORAGE VALUE: Very palatable to all classes of stock and furnishes excellent sheep feed, sometimes in sufficient quantity to be important.

***Poa arida* Vasey**

Arid bluegrass

RANGE: From centr. Ariz. and centr. N. Mex. n. through the Rocky Mts. to Utah and Colo. and the Great Plains to N. Dak. and Man.

DESCRIPTION: An erect perennial from creeping rootstocks with rather rigid, smooth stems 1 to 2 ft. high. Leaves rigid, sharp-pointed, erect, flat or becoming inrolled, the basal 3 to 6 in. long, the stem leaves 1-2 to 2 in. long. Panicle contracted, rather dense, 2 to 5 in. long, the branches erect; spikelets 4 to 9-flowered and about 1-5 to nearly 1-3 in. long.

HABITAT: Dry plains, prairies, meadows and low grounds to elevations of 12,000 feet.

FLOWERING PERIOD: Apr. to Sept.

SEED DISSEMINATION: June to Oct.

FORAGE VALUE: One of the most valuable grasses of the dry regions of the West being palatable to all classes of stock. On the plains of e. Mont. and w. Dak. it is cut for hay.

***Poa bigelovii* Vasey & Scribn.**

Bigelow's bluegrass

RANGE: From Colo. to Tex., n. Mex., s. Cal. and Nev.

DESCRIPTION: A slender, smooth annual 4 to 24 in. high. Leaves flat and narrow, short in arid situations but in moist ones 2 to 4 in. long. Panicle narrow, 2 to 6 in. long, the branches erect; spikelets 3 to 5-flowered and 1-6 to 1-4 in. long.

HABITAT: In dry or moist situations. Springs up abundantly after the summer rains.

FLOWERING PERIOD: Apr. to July.

SEED DISSEMINATION: June to Aug.

FORAGE VALUE: Palatable to all classes of stock and is often abundant enough to be of some importance as a summer feed.

Poa brachyglossa Piper

Narrow-leaved bluegrass

RANGE: From Brit. Col. to Utah and n. Cal.

DESCRIPTION: A tufted perennial with coarse, smooth stems, 1 1-2 to 3 ft. high. Leaves firm, narrow, inrolled, the blades rough, the sheaths smooth, the ligule (spur-like projection where blade meets the sheath), 1-12 in. long. Panicle narrow, 4 to 6 in. long; spikelets 1-4 to 1-3 in. long. Closely resembles *P. nevadensis* but differs in having smooth sheaths and a short ligule.

HABITAT: Dry slopes and cliffs.

FLOWERING PERIOD: More data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: Excellent forage for all classes of stock.

Poa brevipaniculata Scribn. & Williams

Short-panicled bluegrass

RANGE: Colo., N. Mex. and Ariz.

DESCRIPTION: An erect, rather rigid, tufted perennial from stout rhizomes or rootstocks, 6 to 12 in. high. Leaves flat or more often folded together lengthwise, smooth below, rough above and on the margins, the stem leaves 2 to 3, very short, the basal 4 in. or more in length, rigid pointed. Panicle short, broad, closely-flowered; spikelets flattened, 4 to 6-flowered, 1-6 to 1-4 in. long.

HABITAT: On dry soils of meadows and on mountain sides at elevations of 5,500 to 11,500 feet.

FLOWERING PERIOD: More data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: Fair feed for all classes of stock but because of the scanty amount of foliage and its lack of abundance it is not important.

Poa buckleyana Nash

Buckley's bluegrass

RANGE: From Mont. and S. Dak., e. Cal. and n. e. Wash.

DESCRIPTION: A slender, tufted perennial with erect, rigid, smooth and unbranched stems 1-2 to 2 ft. tall. Leaves 1 to 4 in. long, about 1-12 in. wide, erect, flat or becoming inrolled. Panicle 1 to 4 in. long, contracted, the branches erect, usually purplish; spikelets 2 to 5-flowered and about 1-6 to 1-4 in. long.

HABITAT: Generally on rather dry or sandy, well drained soil in full sunlight, though it often makes a luxuriant growth along streams or on irrigated land. At elevations of 3,000 to 10,500 ft.

FLOWERING PERIOD: June to Aug.

SEED DISSEMINATION: Aug. and Sept.

FORAGE VALUE: A very valuable forage for all classes of stock. It produces a large amount of foliage and is one of the most widely distributed and abundant bluegrasses. Accordingly it often affords a large amount of forage which is valued for winter as well as summer pasturage. It is considered the second most important grass in District 2.

Poa capillarifolia Scribn. & Williams. See *P. idahoensis* Beal.**Poa compressa** L.

Canadian bluegrass

RANGE: From Nfd. and Brit. Col. to N. C. and Cal. Naturalized from Europe. A native also of Asia.

DESCRIPTION: A bluish-green, smooth perennial from extensive, creeping rootstocks and not tufted, with wiry, flattened stems 1-2 to 2 ft. tall, decumbent at the base. Leaves 1 to 4 in. long and about 1-12 in. wide, smooth. Panicle narrow, 1 to 3 in. long; spikelets 3 to 6, rarely 9-flowered, about 1-6 to 1-4 in. long. Closely resembles *P. pratensis* but is distinguished from it by its more decided blue

color and its strongly flattened, scattered stems, its lower habit of growth and smaller panicle. Known also as English bluegrass.

HABITAT: It will grow upon a great variety of soils, even upon those so poor and thin that other grasses fail. Widely distributed in wet and moist meadows, woodlands, among bushes, and in well drained grassy park areas up to an elevation of about 9,500 feet. Also cultivated as a pasture grass.

FLOWERING PERIOD: May to Sept.

SEED DISSEMINATION: July to Oct.

FORAGE VALUE: Palatable to all classes of stock and often furnishes considerable forage. It is ranked as one of the ten most important grasses in District 6 and in District 2 is one of the 25 most important.

***Poa epilys* Scribn.**

Smooth mountain bluegrass

RANGE: From Colo. to n. e. Wyo., centr. Mont., e. Oreg. and Utah.

DESCRIPTION: A rather slender, erect, closely tufted perennial with smooth stems 1-2 to 3 ft. high. Leaves numerous, smooth, slender, flat or inrolled when dry, often 8 in. or more in length. Panicle contracted, closely flowered, usually nodding, and about 1 to 3 in. long.

HABITAT: On dry, rocky and moist alpine sites at elevations of 6,500 ft. in Oreg. and Mont. to 13,000 ft. in Colo.

FLOWERING PERIOD: July and Aug.

SEED DISSEMINATION: Aug. and Sept.

FORAGE VALUE: Palatable and nutritious to all classes of stock but generally occurs as small plants on dry alpine sites and is consequently of little importance. On the Minam N. F., Oreg., however, it is considered important.

***Poa fendleriana* (Steud.) Vasey**

Fendler's bluegrass

RANGE: From e. Wash. to Wyo., N. Mex., n. Mex. and s. Cal.

DESCRIPTION: A tufted perennial with rough, erect stems 1 to 2 ft. high. Leaves pale green, mostly basal, narrow, rough and firm, and up to 8 in. in length. Panicle narrow, contracted, 1 to 3 in. long; spikelets flattened, 4 to 7, rarely more, flowered, and about 1-3 in. long. Also known as Mutton-grass.

HABITAT: On dry hills, mesas and rocky slopes to elevations of 11,500 feet. Quite drought resistant.

FLOWERING PERIOD: Apr. to June.

SEED DISSEMINATION: May to July.

FORAGE VALUE: Palatable to all classes of stock and often fairly abundant. It starts growth very early in spring and consequently is important when there is little other forage. It is considered one of the 20 most important grasses of District 2.

***Poa gracillima* Vasey**

Slender bluegrass

RANGE: From e. centr. Cal. to n. Idaho and Brit. Col.

DESCRIPTION: A smooth, densely tufted perennial with erect stems from usually a decumbent base, 1 to 2 ft. high. Leaves mostly basal, soft, narrow, flat and 1 to 6 in. long. Panicle 2 to 4 in. long, loose, open, and erect; spikelets openly 3 to 5-flowered, and 1-4 to 1-3 in. long.

HABITAT: Dry or wet, rocky soil on ridges and mountains.

FLOWERING PERIOD: May to Aug.

SEED DISSEMINATION: June to Sept.

FORAGE VALUE: Palatable to all classes of stock in the forepart of the season but later dries up, becomes wiry and rather unpalatable.

Poa hanseni Scribn.

Hansen's bluegrass

RANGE: A little known species from isolated localities in Cal.

DESCRIPTION: A densely tufted, smooth perennial with slender, erect stems 6 to 18 in. high. Leaves mainly basal, fine, cylindrical and about 2 to 5 in. long; usually two shorter leaves on the stems. Panicle narrow, 1 to 2 1-2 in. long, the branches erect; spikelets about 1-6 to 1-5 in. long and 2 to 3-flowered.

HABITAT: Generally on loamy, moist soil.

FLOWERING PERIOD: More data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: Good forage for all classes of stock.

Poa idahoensis Beal

Idaho bluegrass

P. capillarifolia Scribn. & Williams

RANGE: Wash. to Idaho and Cal.

DESCRIPTION: A densely tufted perennial from a slender rootstock with erect, slender stems 6 to 18 in. high. Leaf-sheaths smooth, loose and papery; blades narrow, threadlike, cylindrical, soft, rough, the basal as much as 10 in. long. Panicle narrow but loose, 1 to 4 in. long; spikelets 1-5 to 1-4 in. long.

HABITAT: On rocky and open slopes.

FLOWERING PERIOD: Apr. to June.

SEED DISSEMINATION: May to July.

FORAGE VALUE: Palatable to all classes of stock and often abundant but seldom of much value except in the early spring because of its local distribution.

Poa interior Rydb.

Inland bluegrass

RANGE: From the Canadian Rockies to N. Mex. and w. N. Dak.

DESCRIPTION: A tufted perennial with slender, erect, unbranched stems 6 to 24 in. high. Leaves few in number, 1 to 4 in. long, about 1-12 in. wide or less, erect. Panicle 2 to 5 in. long, the branches erect or ascending; spikelets 2 to 5-flowered and 1-8 to 1-5 in. long.

HABITAT: In wet meadows and gravelly loam at elevations up to 10,000 feet.

FLOWERING PERIOD: June to Aug.

SEED DISSEMINATION: July to Sept.

FORAGE VALUE: Grazed by all classes of stock to a limited extent.

Poa juncifolia Scribn.

Alkali bluegrass

RANGE: From n. w. Mont. to Utah and Colo.

DESCRIPTION: A rather rigid, erect, smooth, tufted perennial 6 to 24 in. high. Leaves 1 to 4 in. long, 1-12 in. or less wide and the margins rough and inrolled. Panicle 2 to 6 in. long, narrow, the branches erect; spikelets 3 to 5-flowered and about 1-5 to 1-4 in. long.

HABITAT: Generally on dry foothills, plains and benches, but also on gentle slopes and in dry meadows.

FLOWERING PERIOD: June and July.

SEED DISSEMINATION: Aug.

FORAGE VALUE: Good forage for all classes of stock. Generally occurs only in scattering stands but sometimes in nearly a continuous sod and becomes important.

Poa laevigata Scribn.

Smooth bluegrass

RANGE: From Que. to e. Wash. and s. in the mts. to N. Mex. and n. Utah.

DESCRIPTION: A tufted perennial with slender, erect, smooth, stems 2-3 to 3 ft. high. Leaves pale green, narrow, inrolled and up to 8 in. long. Panicle slender,

2 to 6 in. long; the spikelets 3 to 5-flowered and about 1-5 to 1-3 in., or more, in length.

HABITAT: On dry, gravelly soils, hillsides and open, grassy areas to altitudes of about 9,000 feet.

FLOWERING PERIOD: June to Aug.

SEED DISSEMINATION: July to Sept.

FORAGE VALUE: Readily grazed by cattle and horses and slightly by sheep, and although it seldom is the predominating species in any type it furnishes a great deal of forage.

Poa laxa Haenke. Synonymous, in its western range, with *P. alpicola* Nash.

Poa leibergii Scribn.

Leiberg's bluegrass

RANGE: High mts. of the Sierra Nevada, Cal., and in s. e. Oreg.

DESCRIPTION: A densely tufted, fibrous-rooted perennial with slender stems 2 to 8 in. high. Leaves numerous, mostly basal, firm, inrolled, smooth and about 1 to 2 in. long. Panicle narrow, 1 to 2 in. long, the branches short and erect, close to the stem; spikelets 2 to 3-flowered and 1-6 to 1-4 in. long.

HABITAT: Alpine meadows and sterile, gravelly, alpine flats at elevations of 10,000 to about 12,000 ft. in Cal. In Oreg. on the summits of ridges in juniper timber at an elevations of about 5,000 feet.

FLOWERING PERIOD: More data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: Palatable to all classes of stock and produces a good deal of foliage but so limited in distribution that it is not important.

Poa leptocoma Trin.

Slender mountain bluegrass

RANGE: From s. e. Alaska to Mont., Colo. and Oreg.

DESCRIPTION: A slender, erect, pale green, smooth perennial 12 to 20 in. high. Leaves flat, thin and delicate, smooth, 2 to 5 in. long and 1-12 to 1-6 in. wide. Panicle 2 to 4 in. long, the slender, smooth branches bearing a few spikelets above the middle and spreading or ascending, spikelets 1-5 to 1-4 in. long and 2 or 3-flowered.

HABITAT: Wet meadows.

FLOWERING PERIOD: More data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: Palatable to all classes of stock.

Poa lettermani Vasey

Letterman's bluegrass

RANGE: From Colo. and Wyo. to Wash.

DESCRIPTION: A dwarf, densely tufted perennial from a thick mass of fibrous roots, with erect stems 1 to 5 in. high. Leaves mostly basal, flat, 1 to 2 in. long and less than 1-12 in. wide. Panicle 1-2 to 1 in. long, rather dense, with short, erect branches each bearing from 1 to 3 spikelets 1-8 to 1-6 in. long and 2 to 4-flowered.

HABITAT: Alpine summits, in Colo. at elevations of 11,000 to 14,000 feet; in Wash. at about 9,000 feet.

FLOWERING PERIOD: More data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: Palatable to all classes of stock but its habitat and limited size and abundance generally make it unimportant as forage.

Poa longepedunculata Scribn.

Long-stalked bluegrass

RANGE: Wyo to n. N. Mex.

DESCRIPTION: A rather densely tufted perennial from short creeping rootstocks, with erect, slender stems 12 to 30 in. high. Leaves of the sterile shoots and basal ones 2 to 8 in. long, those of the flower stalks often reduced to a point. Panicle dense, 2 to 3 in. long; spikelets about 1-4 in. long and 3 to 5-flowered.

HABITAT: Moist, loose soil of hills and mountain sides, usually under timber at elevations of about 5,000 to 12,500 feet.

FLOWERING PERIOD: June to Aug.

SEED DISSEMINATION: Aug. and Sept.

FORAGE VALUE: Palatable and nutritious to all classes of stock but especially cattle and horses. Often abundant and, since it forms large, close tufts, it frequently furnishes considerable forage.

Poa longiligula Scribn. & Williams

Long-liguled bluegrass

RANGE: From Mont. and S. Dak. to n. w. N. Mex., Cal. and Oreg.

DESCRIPTION: A tufted perennial with rather harsh, erect stems 12 to 20 in. high. Leaves mainly basal, rough, rather rigid and abruptly sharp pointed, flat or folded lengthwise, 3 to 10 in. long with conspicuous ligules 1-5 to 1-4 in. or more, long. Panicle 3 to 6 in. long, loose; spikelets flattened, 4 to 5-flowered and 1-5 to 2-5 in. long.

HABITAT: In medium and scattered stands on well drained, open sites.

FLOWERING PERIOD: May to July.

SEED DISSEMINATION: July and Aug.

FORAGE VALUE: Palatable to all classes of stock but of greatest value in the early part of the season.

Poa longipila Nash

Wyoming bluegrass

RANGE: A little known species apparently only from n. Wyo.

DESCRIPTION: An erect perennial, entirely smooth and free from hairs with the exception of the lemma, with stems 1 to 1 1-2 ft. high. Leaves erect, firm, slightly roughened above, 1 to 3 1-2 in. long and about 1-8 to 1-6 in. wide. Panicle loose and open, 2 1-2 to 3 1-2 in. long, the branches widely spreading; spikelets 1-4 to 1-3 in. long.

HABITAT: More data needed.

FLOWERING PERIOD: More data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: Probably palatable but the short leaves and its lack of distribution make it unimportant.

Poa lucida Vasey

Light bluegrass

RANGE: From Mont. to S. Dak. and N. Mex.

DESCRIPTION: A slender, tufted perennial with smooth stems 1 1-2 to 2 1-2 ft. high. Leaves flat, the basal ones 5 to 7 in. long, the stem leaves 2 to 3 in. long. Panicle 4 to 6 in. long, narrow, less than 1 in. wide; spikelets 1-4 to 1-3 in. long 3 or 4-flowered.

HABITAT: Dry, rocky places, moist brooksides and meadows at elevations of 5,000 to 10,000 feet.

FLOWERING PERIOD: July to Sept.

SEED DISSEMINATION: Aug. to Oct.

FORAGE VALUE: Palatable to all classes of stock and often abundant as a meadow grass in the central Rockies.

***Poa macrantha* Vasey**

Seashore bluegrass

RANGE: Along the coast from n. Cal. to Wash.

DESCRIPTION: A perennial from stout, extensive, creeping rootstocks with erect stems from a decumbent base, 1-2 to 1 1-2 ft. high, the sterile shoots widely spreading. Leaf-sheaths smooth, yellowish and papery; blades smooth and in-rolled or folded and about 6 to 10 in. long. Panicle narrow, contracted, sometimes dense and spike-like, 2 to 5 in. long, the branches in 2's and 3's, erect, the longest 1 1-2 to 2 1-2 in. long; spikelets large, about 1-2 in. long and about 5-flowered. Also known as Large-flowered bluegrass.

HABITAT: Grows on sand dunes along the coast.

FLOWERING PERIOD: More data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: Too coarse to be of any value as forage but valuable as a sand binder.

***Poa nematophylla* Rydb.**

Colorado bluegrass

RANGE: Not definitely known, collected so far only in n. and n. w. Colo.

DESCRIPTION: A perennial from a creeping rootstock with a slender stem 3 to 12 in. high. Leaves mostly basal, very narrow, strongly inrolled, and 1 to 6 in. long. Panicle narrow, about 1 to 2 in. long, branches 1-12 to 1-5 in. long and bearing often only a single spikelet; spikelets about 1-3 in. long and about 4-flowered.

HABITAT: On dry sites.

FLOWERING PERIOD: More data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: Nothing is known as to the forage value of this species. Its few, fine, basal leaves are probably very palatable but it occurs too rare to be of importance.

***Poa nemoralis* L.**

Wood bluegrass

RANGE: From Nfd. to Alaska, s. to Pa. and Minn. and, in the Rocky Mts. to Colo.

DESCRIPTION: A slender, erect and rather rigid, tufted perennial 1-2 to 2 1-2 ft. high, the stems leafy throughout. Leaves flat, 1 to 3 1-2 in. long and 1-12 in. wide. Panicle 1 1-2 to 4 in. long, open and spreading; spikelets 2 to 5-flowered, and 1-8 to 1-5 in. long. The most characteristic feature is the large number of spikelets.

HABITAT: Moist meadow areas along streams but never in dry park areas nor in wet meadows.

FLOWERING PERIOD: June to Sept.

SEED DISSEMINATION: July to Oct.

FORAGE VALUE: Palatable and nutritious to all classes of stock and often affords excellent hay but generally is too local in distribution. Sometimes becomes too stalky to be highly relished.

***Poa nervosa* (Hook.) Vasey**

Nerved bluegrass

RANGE: From Brit. Col. to Oreg., Wyo. and centr. Mont.

DESCRIPTION: A loosely tufted perennial from slender creeping rootstocks, with erect, slender, smooth stems 1 1-2 to 3 ft. tall or sometimes less. Leaves flat, 1 to 10 in. long and 1-12 to 1-6 in. wide. Panicle 2 to 5 in. long, the branches slender, spreading and few-flowered near the end; spikelets loosely 3 to 8-flowered and 1-3 to 1-2 in. long; lemmas prominently 5-nerved.

HABITAT: In parks and open forest on dry or moist loam soils at medium elevations.

FLOWERING PERIOD: June and July.

SEED DISSEMINATION: July and Aug.

FORAGE VALUE: Palatable to all classes of stock and produces an abundance of foliage but, while it is widely distributed, it is too sparse to be very important.

***Poa nevadensis* Vasey**

Nevada bluegrass

RANGE: From Brit. Col. to Cal., Nev., Colo., w. S. Dak. and Mont.

DESCRIPTION: A tufted perennial with smooth, erect stems 1 1-2 to 3 ft. high. Leaves with rough sheaths and firm inrolled, rough blades 6 to 12 in. long on sterile shoots and 1 to 4 in. long on flowering stems. Panicle narrow, 4 to 6 in. long; spikelets narrow 1-4 to 1-3 in. long.

HABITAT: Widely distributed on plains, dry meadows and in woods, generally on moist, loose, sandy loam soil.

FLOWERING PERIOD: May to Aug.

SEED DISSEMINATION: July to Sept.

FORAGE VALUE: Palatable to all classes of stock and generally produces an abundance of foliage. It is most palatable in the early spring as it becomes coarse later. It is seldom abundant but being widely distributed it furnishes considerable forage.

***Poa occidentalis* Vasey**

Western bluegrass

P. platyphylla Nash & Rydb.

not *P. occidentalis* (Vasey) Rydb.

RANGE: Utah, Colo. and N. Mex.; possibly also in Cal.

DESCRIPTION: A slender or somewhat stout, leafy perennial 1 1-2 to 3 ft. high. Leaves 5 to 6 on the stem, the lower ones 2 to 4 in. long, the others longer, the upper one 5 to 8 in. long and sheathing the base of the panicle; sheaths flattened, rough, mostly much longer than the internodes. Panicle large and loose 6 to 12 in. long; the branches slender, far apart, mostly in 3's or the lower sometimes in 5's, and 4 to 6 in. long, erect, becoming spreading; spikelets mostly 3-flowered, 1-12 to 1-8 in. long, and light green.

HABITAT: Moist soil in the timber, in meadows or along streams.

FLOWERING PERIOD: June to Sept.

SEED DISSEMINATION: July to Oct.

FORAGE VALUE: Very palatable and nutritious to all classes of stock, but too scattering to be of much value.

***Poa olneyae* Piper**

Olney's bluegrass

RANGE: From s. and e. Cal. to Brit. Col. and e. through Idaho to w. Mont.

DESCRIPTION: A perennial from creeping rootstocks with stems 1 to 2 ft. high. Leaves flat or folded, smooth on lower surface and from slightly to quite rough on upper surface. Panicle 1 to 4 in. long, rather open the branches ascending or spreading; spikelets closely flowered.

HABITAT: Alpine meadows, open woods and rocky banks.

FLOWERING PERIOD: June and July.

SEED DISSEMINATION: July and Aug.

FORAGE VALUE: Palatable to all classes of stock and produces an abundance of foliage. These qualities together with its common occurrence and wide distribution make it an important forage plant. It is considered one of the 5 most im-

portant grasses of District 6. The only disadvantage is that it is easily injured by frost, thus shortening its period of usefulness.

Poa paddensis Williams

Purple bluegrass

P. purpurascens Vasey, not Spreng.

P. subpurpurea Rydb.

RANGE: From Brit. Col. to Oreg., Colo. and Mont.

DESCRIPTION: An erect, tufted, somewhat wiry perennial 6 to 16 in. high. Leaves flat, 2 to 6 in. long and 1-12 to 1-6 in. wide. Panicle rather densely flowered 1 to 3 in. long; spikelets 3 to 5-flowered and about 1-5 to 1-3 in. long.

HABITAT: Moist hillsides and mountain meadows.

FLOWERING PERIOD: July and Aug.

SEED DISSEMINATION: Aug. and Sept.

FORAGE VALUE: Palatable to all classes of stock but of too scattering occurrence to be important.

Poa pattersoni Vasey

Patterson's bluegrass

RANGE: Ariz., Colo. and w. Wyo.

DESCRIPTION: A low, densely tufted perennial with slender stems 4 to 6 in. high. Leaves, rather numerous at base, 2 to 3 in. long, flat or folded and smooth. Panicle dense, oblong, about 1 to 2 in. long; spikelets 1-6 to 1-4 in. long and 2 to 3-flowered.

HABITAT: Mt. peaks; in Colo. at elevations of 11,000 to 14,000 ft., in n. w. Wyo. about 7,500 feet.

FLOWERING PERIOD: June to Aug.

SEED DISSEMINATION: July to Sept.

FORAGE VALUE: Palatable to all classes of stock but its small size and limited abundance make it unimportant.

Poa phoenicea Rydb.

Pike's Peak bluegrass

RANGE: Apparently confined to the Pike's Peak region, Colo.

DESCRIPTION: A perennial from a horizontal rootstock with a leafy stem 1 1-2 to 2 ft. high. Leaves rather firm, strongly veined, 4 to 8 in. long and about 1-12 in. wide. Panicle 2 to 4 in. long, open; spikelets 4 or 5-flowered and about 1-4 in. long.

HABITAT: High mountains.

FLOWERING PERIOD: More data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: Palatable to all classes of stock and produces a good deal of leafy foliage, but its local range prevents it from being an important forage grass.

Poa platyphylla Nash & Rydb. See *P. occidentalis* Vasey.

Poa pratensis L.

Kentucky bluegrass

RANGE: Widely distributed throughout N. Am., Europe and Asia but probably native only in the northern and mountainous regions. It has been submitted from 47 National Forests and from all districts.

DESCRIPTION: A slender, erect, stoloniferous perennial with smooth stems 1 to 4 ft. tall. Leaves narrow, abrupt pointed, flat, 1-24 to 1-4 in. wide, those of the stem 2 to 6 in. long, the basal much longer. Panicle 2 1-2 to 8 in. long, usually pyramidal, the branches spreading or ascending 1 to 3 in. long, divided and spikelet bearing above the middle; spikelets 3 to 5-flowered, 1-6 to 1-5 in. long.

HABITAT: Prefers a soil of limestone origin and makes its best growth on the lime soils of Ky. and Tenn. It is common in fields, meadows, and on high mountain slopes in rich moist loam soil.

FLOWERING PERIOD: May to Aug.

SEED DISSEMINATION: July to Sept.

REPRODUCTION: Produces an abundance of seed and also spreads freely by its running rootstocks, though it is generally slow to start.

FORAGE VALUE: Very palatable and nutritious to all classes of stock and produces an abundance of leafy foliage. Generally it is not abundant on the National Forest ranges but it has such a wide range and is of such high value that it is one of the important forage grasses of the West and is considered one of the 10 most important grasses in District 6. It is an important cultivated meadow grass in all parts of the U. S. and is used extensively for lawns.

Poa pratericola Rydb. & Nash See *P. arida* Vasey.

Poa pseudopratensis Scribn. & Rydb.

Prairie bluegrass

RANGE: From Man. and Sask. to Nebr. and Colo.

DESCRIPTION: An erect, smooth perennial 1 to 2 1-2 ft. high from running rootstocks. Leaves 1-12 to 1-4 in. wide, smooth beneath, a little rough above and on the margins, those of the stem 1 to 3 1-2 in. long, the basal 6 to 10 in. long. Panicle 2 to 5 in. long, the branches spreading or ascending 1 to 2 in. long; spikelets 3 to 5-flowered and 1-4 to 1-3 in. long.

HABITAT: Moist or wet sites.

FLOWERING PERIOD: July and Aug.

SEED DISSEMINATION: Aug. and Sept.

FORAGE VALUE: Very palatable and nutritious to all classes of stock and quite important at lower elevations where it is abundant.

Poa purpurascens Vasey. See *P. paddensis* Williams.

Poa reflexa Vasey & Scribn.

Nodding bluegrass

RANGE: From Idaho and Mont. to n. N. Mex.

DESCRIPTION: A perennial with slender, smooth, erect stems 10 to 24 in. high. Leaves abundant, chiefly basal, soft, abruptly pointed, flat and 2 to 4 in. long. Panicle open, 2 to 4 in. long, the branches very slender, spreading and becoming reflexed, spikelet bearing near the ends; spikelets 2 or 3-flowered 1-8 to 1-6 in. long.

HABITAT: In wet meadows at medium to high elevations.

FLOWERING PERIOD: July and Aug.

SEED DISSEMINATION: Aug. and Sept.

FORAGE VALUE: Palatable to all classes of stock but usually of rare occurrence and therefore of little importance.

Poa rhizomata Hitchc.

Timber bluegrass

RANGE: A recently described species the range of which is not definitely known. Collected in n. Cal., Idaho and s. Mont.

DESCRIPTION: A perennial from creeping rootstocks with smooth, erect stems 1 to 2 ft. high. Leaves with smooth sheaths, the lower loose and papery; blades flat or folded 1-24 to 1-12 in. wide and 1 to 8 in. long. Panicle oblong, con-

tracted, 1 to 2 in. long, the branches short, slender, ascending and few-flowered; spikelets about 1-4 in. long, 3 to 5-flowered.

HABITAT: Damp, shady soil.

FLOWERING PERIOD: June to Aug.

SEED DISSEMINATION: July to Sept.

FORAGE VALUE: Palatable to all classes of stock and produces a good deal of foliage but not very important due to its lack of distribution and abundance.

***Poa rupicola* Nash**

Timberline bluegrass

RANGE: W. Mont., Wyo. and Colo. Possibly also in Utah, Idaho and n. e. Oreg.

DESCRIPTION: A tufted perennial with an erect stem 1-3 to 1 1-2 ft. high. Leaves narrow, 1 to 3 in. long. Panicle narrow 1 1-2 to 4 in. long; spikelets usually 3-flowered and from 1-12 to 1-4 in. long.

HABITAT: On alpine, usually dry, rocky or sandy sites to an elevation of 13,000 ft. in Colo.

FLOWERING PERIOD: July and Aug.

SEED DISSEMINATION: Aug. and Sept.

FORAGE VALUE: Palatable to all classes of stock but produces a small amount of foliage. It generally occurs in scattering stands but on the Lewis and Clark N. F. it is one of the most important grasses at high elevations.

***Poa sandbergii* Vasey**

Little bluegrass

RANGE: From Brit. Col. to Mont., Wyo., Utah and Cal.

DESCRIPTION: A tufted perennial with slender stems 1-2 to 2 1-2 ft. high. Leaves mostly basal 2 to 4 in. long, very narrow, those of the stem about 2 in number and 1 in. long or less. Panicle 1 1-2 to 3 in. long, sometimes very narrow, or less than 1 in. wide, the branches ascending and spikelet-bearing above the middle; spikelets 2 to 4-flowered about 1-4 in. long. Known also as Sandberg's bluegrass and Purple-jointed poa.

HABITAT: Widely distributed in sage brush, open timber and well drained park areas. It grows luxuriantly in rich, clay loam but as a rule inhabits inferior, shallow soils and is often the most common and characteristic grass on scablands and dry rocky or sandy soils. It has an unusually wide local altitudinal range, in n. e. Oreg. it occurs from 2,000 to 8,000 ft. and in Wyo. extends to about 10,000 ft. It is very drought resistant.

FLOWERING PERIOD: June to Sept.

SEED DISSEMINATION: July to Oct.

REPRODUCTION: A good deal of seed is produced but from its higher range has a comparatively low viability and the seed matured at the lower elevations has only a fair viability.

FORAGE VALUE: Very palatable and readily grazed by all classes of stock in the spring and early summer. Horses and cattle continue to graze it to some extent throughout the summer and in the fall, when air cured, the leaf-blades are again eagerly grazed by all classes of stock. It is widely distributed and often abundant. It is one of the 5 most important grasses of District 2 and one of the 6 most important grasses in District 6.

***Poa saxatilis* Scribn. & Williams**

Rock bluegrass

RANGE: Wash., Oreg. and Idaho.

DESCRIPTION: A slender, closely tufted perennial 8 to 14 in. high with smooth stems erect or somewhat bent below and with conspicuous purplish joints. Leaves

mostly basal, soft, smooth, flat, 1 to 3 in. long. Panicle 2 to 3 in. long the branches ascending, slender and somewhat flexuous, flower bearing above the middle; spikelets flattened, 3 to 5-flowered and about 1-4 to 1-3 in. long.

HABITAT: Rocky soils at the higher elevations.

FLOWERING PERIOD: July and Aug.

SEED DISSEMINATION: Aug. to early Oct.

FORAGE VALUE: Palatable to all classes of stock, especially in the spring and early summer. It is usually rather scattering but sometimes is a valuable constituent of early sheep feed.

***Poa scabrella* (Thurb.) Benth.**

Malpais bluegrass

RANGE: From Oreg., Idaho and w. Mont. to Lower Cal. and Ariz. and e. into N. Mex.

DESCRIPTION: A tufted perennial with erect stems 1 to 3 ft. high and usually rough, at least below the panicle. Leaves mostly basal, flat, narrow, usually 1-24 in. wide, slightly roughened and 2 to 6 in. long. Panicle narrow, 2 to 5 in. long; spikelets narrow 1-4 to 2-5 in. long.

HABITAT: Open, well drained soil or on scabland.

FLOWERING PERIOD: May to Aug.

SEED DISSEMINATION: June to Aug.

FORAGE VALUE: Palatable to all classes of stock, especially in the spring and after fall rains, and furnishes an abundance of foliage. It generally occurs only in scattered stands but sometimes occurs abundantly. It is the most important bunchgrass at lower elevations on the Sierra N. F.

***Poa subaristata* Scribn.**

Yellowstone bluegrass

RANGE: Idaho, w. and centr. Mont. and w. Wyo.

DESCRIPTION: A slender, densely tufted perennial 8 to 20 in. high. Leaves rough, folded, 2 1-2 to 8 in. long. Panicle narrow, dense, 1 1-2 to 4 in. long; spikelets 4 to 7-flowered 1-4 to 2-5 in. long.

HABITAT: Moist or dry loamy or gravelly soil on hills and mountain slopes.

FLOWERING PERIOD: May and June.

SEED DISSEMINATION: June and July.

FORAGE VALUE: Palatable to all classes of stock and often one of the principal grasses within its range. It is a promising species for cultivation in northern pastures.

***Poa subpurpurea* Rydb. See *P. paddensis* Williams.**

***Poa sylvestris* Gray**

Woodland bluegrass

RANGE: From N. Y. to Wis., Nebr., Tex. and Fla.

DESCRIPTION: A slender, tufted perennial with smooth, erect, slightly flattened stems 1 to 4 ft. high. Leaves smooth beneath, rough above, 1-12 to 1-4 in. wide, those of the stem 1 1-2 to 6 in. long, the basal much longer. Panicle 4 to 8 in. long, the short slender branches spreading or drooping; spikelets 2 to 4-flowered and 1-10 to 1-6 in. long.

HABITAT: Rich woods and thickets.

FLOWERING PERIOD: Apr. to July.

SEED DISSEMINATION: June to Aug.

FORAGE VALUE: More data needed.

Poa triflora Gilib.

Fowl bluegrass

RANGE: From Nfd to s. e. Alaska, Oreg., centr. Utah, Colo., Nebr. and N. J. Also in Europe and Asia.

DESCRIPTION: An erect, smooth perennial 1 to 5 ft. high. Leaves narrow, soft, 2 to 6 in. long and 1-12 to 1-6 in. wide. Panicle 4 to 13 in. long, open, the branches spreading or ascending 2 to 5 in. long; spikelets 2 to 4-flowered about 1-8 to 1-6 in. long. Known also as fowl meadow-grass.

HABITAT: Swamps, wet meadows along creeks and in timber up to 9,500 feet.

FLOWERING PERIOD: Late June to Aug.

SEED DISSEMINATION: July to Sept.

FORAGE VALUE: Palatable to cattle and horses but grazed by sheep only when other succulent weeds are absent. It generally is neither widely distributed nor abundant and accordingly is not important.

Poa trivialis L.

Rough bluegrass

RANGE: A native of Europe. Now naturalized in N. Am. from Nfd. to s. e. Alaska and the Aleutian Islands and s. to S. C. and La. in the East and Mont. and Wash. in the West.

DESCRIPTION: A perennial with erect stems from a somewhat decumbent base, 1 to 3 ft. high, and rough below the panicle. Leaves flat, rough, 2 to 7 in. long and 1-12 to 1-6 in. wide. Panicle 4 to 6 in. long, open, the branches usually spreading or ascending; spikelets 2 or sometimes 3-flowered about 1-8 in. long. Known also as Rough meadow-grass.

HABITAT: Succeeds best where the climate and soil are rather moist and cool but is not adapted to sandy soil. Occurs in meadows and waste places.

FLOWERING PERIOD: May to Aug.

SEED DISSEMINATION: June to Sept.

FORAGE VALUE: Palatable to all classes of stock but is generally not abundant on the range. However, in District 6 it is considered one of the fifteen most important grasses. It has been cultivated for many years in England and other countries of Europe and is highly esteemed as an ingredient in mixtures for permanent pastures.

Poa vaseyana Scribn.

Vasey's bluegrass

RANGE: Middle and w. Colo.

DESCRIPTION: An erect, robust perennial, 1 to 2 1-2 ft. high. Leaves rough, flat or folded, the tips abrupt pointed, rather firm, those of sterile shoots 8 to 12 in. long and 1-6 to 1-5 in. wide, those of the flowering stems 1-3 to 2-5 in. long. Panicle 4 1-2 to 6 in. long, the branches bearing 5 to 10 spikelets on the outer 1-2 or 3-5; spikelets 4 to 6-flowered, about 2-5 in. long.

HABITAT: Mt. meadows.

FLOWERING PERIOD: More data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: Relished by all classes of stock and quite important in parts of Colo.

Poa vaseyochloa Scribn.

Northwest bluegrass

RANGE: In the Cascades and e. Wash. and e. Oreg.

DESCRIPTION: A densely tufted perennial with erect or ascending, smooth stems 5 to 10 in. high. Leaves numerous, folded, abruptly pointed, 1 to 2 in. long, less

than 1-12 in. wide. Panicle 1 to 2 in. long, each branch bearing a single 3 to 5-flowered spikelet 1-8 to 1-5 in. long.

HABITAT: Generally on plains and hills but to some extent in the mountains and in moist areas.

FLOWERING PERIOD: More data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: Probably palatable to all classes of stock and usually produces a fair abundance of foliage but of such scattering occurrence on mountain ranges that it is unimportant.

***Poa wheeleri* Vasey**

Wheeler's bluegrass

RANGE: From Mont. and Idaho to Colo. and centr. Oreg.

DESCRIPTION: A perennial 10 to 30 in. high, from running rootstocks. Leaves mostly basal, rigid, folded or inrolled, with a firm point, up to 10 in. in length and 1-12 to 1-6 in. wide. Panicle open, 4 to 6 in. long, with slender ascending or spreading branches; spikelets 3-flowered and 1-12 to 1-6 in. long. Known also as Wyoming bluegrass.

HABITAT: Moist meadow areas, along streams, and in open timber generally at medium elevations though with a wide local altitudinal range.

FLOWERING PERIOD: While it varies from June to early Sept. it flowers principally during July in all parts of its range.

SEED DISSEMINATION: Middle of July to Sept.

FORAGE VALUE: Very palatable and nutritious to all classes of stock. It furnishes a great deal of foliage and occurs abundantly in many places. It is considered the third most important grass of District 2 and the 8th most important in District 6.

POLYPOGON

A member of *Agrostideae*, the Redtop-Timothy tribe. There are about 10 species, widely distributed in temperate and warm regions, mostly of the Old World. The genus *Polypogon* is characterized as follows: Annual or perennial, spreading, weedy grasses, with flat leaves; spikelets 1-flowered in dense, terminal, bristly panicles; glumes 2, ending in long slender awns; lemma much shorter than the glumes, transparent, short-awned.

***Polypogon littoralis* (With.) Smith**

Shore polypogon

RANGE: Introduced from Europe. Naturalized from Vancouver Island to Colo. and s. Mex. Also in La.

DESCRIPTION: A tufted perennial, 1 to 2 1-2 ft. high with stems bent at base. Leaf-sheaths rough; blades up to 6 in. long, 1-8 to 1-3 in. wide. Panicles oblong, 2 to 6 in. long, somewhat interrupted or lobed; glumes 1-12 to 1-8 in. long, terminating in an awn as long.

HABITAT: Wet places.

FLOWERING PERIOD: May and June.

SEED DISSEMINATION: June and July.

FORAGE VALUE: Of medium palatability and occurring so sparingly that it is practically negligible as forage.

***Polypogon monspeliensis* (L.) Desf.**

Mountain polypogon

RANGE: Native of Europe and Asia. Naturalized from Me. to S. C. and in the West from Brit. Col. to Mont., Kans., n. Mex. and Lower Cal.

DESCRIPTION: A tufted annual with stems erect or decumbent at base, rough below panicle, 4 in. to 3 ft. high. Leaf-sheaths smooth; blades 1 1-2 to 6 in. long, 1-8 to 1-3 in. wide, rough, especially above. Panicles dense and spike-like, 1 to 6 in. long, 1-2 to 1 in. wide, tawny yellow; glumes terminating in an awn 1-4 to 1-3 in. long.

HABITAT: Fields and waste places at low elevations, usually in moist, alkaline soil.

FLOWERING PERIOD: Apr. to Sept.

SEED DISSEMINATION: June to Oct.

FORAGE VALUE: Relished by all classes of stock, especially before the seedheads are developed, but it is seldom abundant enough to be of importance.

PUCCINELLIA

A member of *Festuceae*, the Fescue-Bluegrass-Brome tribe of grasses. There are about 15 species in all temperate regions. The genus *Puccinellia* consists of perennial grasses with pale spikelets, 3 to several-flowered, in narrow or open panicles; glumes unequal, short; lemmas rounded on the back, firm, obscurely nerved. Differs from *Panicularia* chiefly in the obscurely nerved lemmas.

Puccinellia airoides (Nutt.) Wats. & Coult. See *P. nuttalliana* (Schult.) Hitchc.

Puccinellia nuttalliana (Schult.) Hitchc.

Alkali meadow-grass

P. airoides (Nutt.) Wats. & Coult.

RANGE: From s. w. Ont. to Brit. Col., Cal., Nev. and Kans.

DESCRIPTION: Stems tufted, erect, 1 1-2 to 2 ft. high. Leaf-sheaths and inrolled blades smooth; blades 2 to 6 in. long, about 1-10 to 1-8 in. wide. Panicle open 6 to 8 in. long, the branches spreading, naked below; spikelets about 1-4 in. long, usually pale.

HABITAT: In alkaline, usually moist to wet soils, at elevations up to about 11,000 feet.

FLOWERING PERIOD: June to Aug.

SEED DISSEMINATION: July to Sept.

FORAGE VALUE: Palatable to all classes of stock and more succulent and palatable when growing with sedges and rushes in wet alkaline soil than when growing in drier situations. In a few localities it furnishes considerable forage.

REDFIELDIA

A member of *Festuceae*, the Fescue-Bluegrass-Brome tribe. It consists of a single species.

Redfieldia flexuosa (Thurb.) Vasey

Blowout grass

RANGE: From S. Dak. to Colo. and Okla.

DESCRIPTION: A stout, smooth perennial with erect stems 1 1-2 to 4 ft. high from a long, horizontal rootstock. Leaves 1 to 2 ft. long, 1-12 to 1-6 in. wide, inrolled. Panicle open 8 to 24 in. long, the slender flexuous branches widely spreading, the lower 3 to 8 in. long; spikelets about 1-4 in. long, 1 to 3-flowered. Known also as Redfield's grass.

HABITAT: On sandhills and plains. Its deeply penetrating and widely spreading rootstocks make it the pioneer in reclaiming sandhills and blowouts, enabling

other plants, which later replace it, to get a foothold on the shifting sands, and thus put a stop to wind erosion. It is reported to be almost the only grass found on the sand dunes south of the Arkansas River near Garden City, Kans

FLOWERING PERIOD: July and Aug.

SEED DISSEMINATION: Aug. and Sept.

FORAGE VALUE: Of little value as forage but of great economic importance as a soil binder.

SAVASTANA

A member of *Phalarideae*, the Canary-grass tribe. There are about 8 species, natives of temperate and cold regions. They are aromatic perennials with flat leaves and contracted or open panicles; spikelets 3-flowered, the terminal floret perfect, the others staminate; glumes nearly equal, smooth; lemmas with or without an awn.

Savastana odorata (L.) Scribn.

Vanilla-grass

Hierochloe borealis Roem. & Schult.

Hierochloe odorata (L.) Wahl.

RANGE: From Lab. to N. J., Iowa, n. N. Mex., n. Ariz., Wash. and Alaska.

DESCRIPTION: Stems smooth, slender, erect, 6 to 24 in. high from long stolons. Leaves rough, basal and of sterile shoots 4 to 8 in. long, 1 to 3 in. wide, the upper ones 1 to 2 in. long. Panicle 2 to 4 in. long, its branches 1 to 2 in. long, usually spreading, naked below; spikelets yellowish-brown and purple 1-6 to 1-4 in. long. Also known as Holy-grass, Sweet-grass and Seneca-grass.

HABITAT: In wet places, among bushes, on wooded river banks and also in open meadows from middle to higher elevations.

FLOWERING PERIOD: Apr. to Aug.

SEED DISSEMINATION: June to Sept.

FORAGE VALUE: Opinions differ on this point, some claim the species to be unpalatable to stock while others assign to it a certain amount of importance wherever abundant. Observation along this line are needed. The agreeable odor of the plant is due to the presence of *coumarin*, an aromatic vanilla-like alkaloid named from the "coumarou" or Tonka bean. In Europe it is believed to have a tendency to induce sleep and is often hung in bunches over beds; it is called "Holy-grass" there and is strewn before churches. The long leaves of the sterile shoots are much used, especially by Indians, in making baskets and small mats. It makes a good turf and has some value for lawns.

SCHEDONNARDUS

A genus composed of a single species native of centr. N. Am. It is a member of *Chlorideae*, the Grama tribe of grasses.

Schedonnardus paniculatus (Nutt.) Trelease

Schedonnardus

RANGE: From Ill. to N. Dak., Mont., N. Mex., Ariz. and Tex.

DESCRIPTION: An annual with slender, erect, rigid, rough stems 3 to 18 in. tall, branching at the base. Leaves 1 to 2 in. long, 1-12 in. wide or less, flat, rough, usually spirally twisted. Panicle half or more than half the entire height of the plant, the axis and branches triangular in cross section; spikes of panicle numerous, alternate, rigid, widely spreading, the lower 2 to 4 in. long; spikelets 1-flowered, sessile, appressed, alternate on the rachis, 1-10 to 1-8 in. long; glumes narrow,

unequal, with strong rigid keels; lemma longer. Known also as Texas crab-grass and Crab-grass, but should not be confused with common Crab-grass (*Syntherisma sanguinalis*.)

HABITAT: Open areas in rather dry situations; to 7,000 ft. in Ariz.

FLOWERING PERIOD: June to Aug.

SEED DISSEMINATION: July to Sept.

FORAGE VALUE: Low in palatability and usually of such small stature and rare occurrence that it has no value on the range.

Schizachyrium scoparium (Michx.) Nash. See *Andropogon scoparius* Michx.

Setaria spp. See *Chaetochloa* spp.

Sieglingia avenacea (H. B. K.) Kuntze. See *Tridens avenaceus* (H. B. K.) Hitchc.

Sieglingia pulchella (H. B. K.) Kuntze. See *Tridens pulchellus* (H. B. K.) Hitchc.

Sieglingia purpurea (Walt.) Kuntze. See *Triplasis purpurea* (Walt.) Chapm.

Sieglingia stricta (Nutt.) Kuntze. See *Tridens strictus* (Nutt.) Nash.

SITANION

Sitanion is a genus of tufted perennials with flat or inrolled leaves, and dense, terminal spikes with the rachis or spike-axis jointed and readily breaking up on maturity; it is a member of the *Hordeae*, Barley-Wheat tribe of the Grass family.

The spikelets occur usually in pairs, sometimes in 3s, or very rarely singly, at each joint of the rachis; they are 2 to 5-flowered or, very rarely, 1-flowered. The glumes are narrow and bristle-like, either undivided or split in two or divided into many parts from near the base, each lobe or division terminating in a rough, spreading awn. Lemmas all alike, except that the lowest one may be sterile and like the glumes, awl-like, undivided and long-awned, or else split into three divisions or lobes, each lobe terminating in a slender awn. The paleas are 2-keeled, about as long as the lemmas, undivided or partly 2-cleft and 2-awned. The grain is closely adherent to the palea. The genus differs from *Elymus* chiefly in its divided glumes and the breaking up of the spike at maturity; it differs from *Hordeum* chiefly in its cleft glumes, in being more than 1-flowered, in having its spikelets usually in pairs whereas those of *Hordeum* are usually in threes, and in not having the rachilla prolonged as a bristle behind the palea, as in *Hordeum*.

Sitanion belongs wholly to w. N. Am., except that *S. pubiflorum* has been collected in s. Mex. Further study is necessary before the exact number of species can be known, as it is thought by many authorities that a number of the species described are worthy of not more than varietal rank. J. G. Smith in his "Synopsis of the Genus *Sitanion*" (published in 1899) describes 23 species, all but 3 of which occur in the region embraced by the following seven states: Oreg., Cal., Nev., Utah, Ariz., Colo. and N. Mex.

Sitanions are commonly known as Squirrel-tail or Foxtail grasses and usually occur in dry soils. Their awns make them very troublesome to stock and such forage value as they possess is in the forepart of the season or late in the season after the seed-heads have dropped off.

Sitanion breviaristatum J. G. Smith

Short-awned squirrel-tail

RANGE: Oreg. and Cal. A little-known species, rare in herbaria.

DESCRIPTION: Densely tufted, relatively low, 6 to 18 in. high, the stems clothed at base with papery, dead leaf-sheaths. Leaf-blades long, inrolled, rigid, erect or ascending. Spikes 1 or 2 in. long, rarely longer. Glumes split into 3 or more divisions; awns of glumes and lemmas 5-6 in. long or less, spreading or downcurved.

HABITAT: On dry, rocky slopes in arid localities.

FLOWERING PERIOD: More data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: The type specimen of this species was collected by Mr. Coville, Botanist of the Bureau of Plant Industry, and Brig. Gen. Funston, U. S. A., on the Death Valley Expedition of 1891. Mr. Coville has the following note on the species: "This tufted grass was a valuable forage plant for our half-starved horses while we were in the desert. Although in winter inferior to *Stipa viridula* for forage, in summer it was tender and luxuriant."

Sitanion brevifolium J. G. Smith

Short-leaved squirrel-tail

RANGE: Wash. and Oreg. to Mont. and southw. to Utah, Colo., Ariz. and N. Mex. It apparently does not occur in Cal.

DESCRIPTION: A light-colored, tufted perennial, 8 to 24 in. high, the stalks more or less streaked or channeled. Leaf-blades short, narrow, flat or occasionally inrolled, rather rigid, sometimes bluish, smooth below, roughish above; leaf-sheaths smooth. Spikes 2 1-2 to 6 in. long, much overtopping the uppermost leaf; spikelets loosely arranged, the awns spreading, sometimes over 3 in. long.

HABITAT: Dry soils in the mts., 5,000 to 10,000 feet.

FLOWERING PERIOD: July to Aug.

SEED DISSEMINATION: Aug. to Sept.

FORAGE VALUE: Such value as the plant has for forage is in the forepart of the season before the troublesome awns are produced. The harshness of the foliage precludes its being given high rank even when the seed heads are absent.

Sitanion californicum J. G. Smith

California squirrel-tail

RANGE: From Wash. and Idaho to Cal. and N. Mex. One of the most widely distributed and perhaps the commonest of Sitanions on N. F. ranges; it has so far been submitted from all U. S. F. S. Districts except No. 1 and from 31 National Forests.

DESCRIPTION: Densely tufted, 6 in. to 2 ft. high. Leaf-sheaths smooth or rough; leaf-blades flat or becoming involute, smooth beneath and rough above. Spikes rather loose and open, 2 to 3 1-2 in. long, the base often inclosed in the uppermost leaf-sheath. Glumes 4, not cleft or divided, long-awned; lemmas smooth, 1-3 to 5-12 in. long, with awns 1 1-2 to 2 1-2 in. long.

HABITAT: Gravelly or rocky slopes and dry, open woods, mostly at the higher elevations. Collected at 7,600 ft., n. slope, on an alluvial soil, Jemez N. F. Collected in a volcanic ash, at about 3,900 ft., on the Shasta N. F., and, in a reddish clay at 6,500 ft., on the Minam N. F.

FLOWERING PERIOD: Mainly May and June, Shasta N. F.

SEED DISSEMINATION: July to early Sept., Shasta N. F.

FORAGE VALUE: All classes of stock graze this plant with relish when young and tender and before the seed-heads are produced.

Sitanion ciliatum Elmer

Hairy squirrel-tail

RANGE: Wash. e. of the Cascades and Idaho.

DESCRIPTION: An annual or biennial. Stems low, mostly 4 to 8 in. high, but sometimes 1 ft. high, erect, streaked and cindery-pubescent just below the spike; from strong, rigid roots, usually covered with a woolly matrix. Sheaths and at least upper surface of blades cindery-colored, rather long-pubescent; blades narrow and inrolled, those of the sterile shoots usually numerous. Spike about 3 in. long, purplish-brown at maturity. Glumes 4 to 6, 2-cleft to the base. Awns about 2 in. long, twice or three times as long as the lemmas. Known also as Washington squirrel-tail and Mountain foxtail.

HABITAT: Dry, rocky hills. Collected on the Payette N. F. at 7,500 ft., where it is stated to occur on "open sagebrush slopes at fairly high elevations."

FLOWERING PERIOD: July, Payette N. F.

SEED DISSEMINATION: After Aug. 15 on the Payette N. F.

FORAGE VALUE: More data needed. Reported from the Payette N. F. to be eaten to some extent by sheep, but small and very scattering, making it almost negligible in importance.

Sitanion glabrum J. G. Smith

Smooth squirrel-tail

RANGE: From Wash. to Cal. and eastw. to Wyo., Utah and Ariz.

DESCRIPTION: Stems erect, 6 to 15 in. high, shining, smooth, often somewhat whitish-colored. Leaf-sheaths smooth or sometimes slightly roughened; leaf-blades soon involute, smooth or the lower parts roughish, 2 1-2 to 6 in. long. Spikes dense rather slender, slightly flexuous, 1 to 3 1-2 in. long. Glumes, or some of them, 2-cleft nearly to the base; lemmas smooth, the awns slender, 1 or 2 in. long.

HABITAT: In dry, often alkaline soils. Collected at 7,500 ft. on the Tusayan N. F. in Y. P. type.

FLOWERING PERIOD: More data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: Grazed limitedly by stock prior to the development of the troublesome seed-heads.

Sitanion hansenii (Scribn.) J. G. Smith

Hansen's squirrel-tail

Elymus hansenii Scribn.

RANGE: In Cal. Collected also in Idaho on the Lemhi N. F. The gap between these localities has not yet been filled.

DESCRIPTION: Stems loosely tufted, smooth, slender to medium stout, 2 1-2 to 4 ft. high. Leaf-sheaths usually smooth, and streaked or channeled; leaf-blades 4 to 12 in. long, slender, flat or becoming inrolled. Spike rather slender, 2 to 3 1-2 in. long; glumes narrowly lance-shaped, some of them 1-nerved and not cleft or divided, others broader and 3-nerved, often 2-cleft, tipped with 2, sometimes 3, unequal awns, the longer about 1 2-5 in. long; lemmas about 1-2 in. long, terminating in a very slender, erect or ascending awn, 1 to 2 in. long. A peculiar species, connecting this genus with *Elymus*.

HABITAT: More data needed.

FLOWERING PERIOD: More data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: More data needed.

Sitanion hystrix (Nutt.) J. G. Smith

Bottle-brush squirrel-tail

RANGE: From e. Wash and e. Oreg. to w. Mont. and s. to Utah and Colo.

DESCRIPTION: Stems slender, erect or ascending, rough above and somewhat minutely pubescent throughout, 4 to 12 in. high, clothed at base with papery leaf-sheaths, growing in dense, spreading tufts. Sterile shoots numerous and leafy, 1-3 to 2-3 the length of the flowering stalks. Leaf-blades roughish-pubescent throughout, narrow, flat or at length becoming inrolled, prominently veined, rough-margined, erect or ascending, the blades of the stems about 2 1-2 to 5 in. long. Spike 2 to 3 in. long, erect or slightly flexuous, densely-flowered, the basal portion sometimes partly inclosed in the uppermost leaf-sheath. Glumes split almost to the base into 2 parts, unequally 2-awned, the awns spreading, about 1 1-2 in. long. Lemmas minutely pubescent, 3-awned, the awns approximately 1 1-2 in. long, the middle awn noticeably slenderer and shorter than the two outer ones and curved away from them. The specific name *hystrix* is Greek for "porcupine," alluding to the very dense, bristly spikes.

HABITAT: On shale hills, among sagebrush on high plains, and on desert and saline range. Collected on a rocky hillside at 7,400 ft. on the Whitman N. F.

FLOWERING PERIOD: More data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: The author, Mr. J. G. Smith, terms the species "worthless"; it is reported, however, that the leafage often seems to be palatable, especially to sheep and cattle, before the troublesome awns make their appearance.

Sitanion jubatum J. G. Smith

Big squirrel-tail

RANGE: From Wash. to Lower Cal. and eastw. to Idaho, Utah (Colo.?) and N. Mex.

DESCRIPTION: Stems robust, smooth, erect, 1 to 3 ft. high. Lower leaf-sheaths usually hairy and the upper sheaths pubescent; leaf-blades narrow, with a tendency to become inrolled, especially towards the tips, rigid, 3 to 6 in. long. Spikes erect, dense, thick and bushy, 1 to 8 in. long. Glumes split into 3 to 12 lobes or divisions, each lobe terminating in an awn 1 to 4 in. long. Lemmas 3-parted at the apex, the lateral lobes short-awned, the middle lobe prolonged into a slender awn, 1 1-2 to 4 3-4 in. long. The largest and most robust species of the genus, with the largest spike and the longest awns.

HABITAT: In dry, rocky situations in the mountains, in open woodland and on plains.

FLOWERING PERIOD: More data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: More data needed. Of course, when the seed-heads are developed the plant is apt to be a menace, if abundant, especially on sheep range.

Sitanion longifolium J. G. Smith

Long-leaved squirrel-tail

RANGE: From s. e. Wash. and n. e. Oreg. to s. Mont., w. Nebr., w. Kans., w. Tex., N. Mex., Ariz. and Nev.

DESCRIPTION: Stems stout, ascending, somewhat bent at the base, often colored with a whitish bloom, 12 to 20 in. high. Leaves of sterile shoots narrow, inrolled, 6 to 12 in. long, often as long as the flowering stems. Leaf-blades of flowering stems mostly flat, 4 to 8 in. long. Spike greenish or purplish, erect or sometimes nodding, 3 to 5 in. long, partly inclosed in the uppermost leaf-sheath. Glumes undivided, but awl-like, rough, spreading, 2 to 3 1-2 in. long. Lemmas not cleft

or else minutely 3-toothed at apex, each lemma terminating in a stout, rough, spreading awn, 1 3-4 to 2 1-2 in. long.

HABITAT: Found at 8,000 ft. in moist soil along drainage basins, on the Beartooth N. F. Collected at 6,300 ft. on the Chiricahua N. F. on cultivated grounds. Collected at 6,600 ft. on the Tusayan N. F. in a draw. Type specimen collected among rocks on the open side of a canyon at 10,000 ft. in Colo.

FLOWERING PERIOD: June and July.

SEED DISSEMINATION: Aug. to Oct.

FORAGE VALUE: More data desired. Reported to be "of very little value for grazing" on the Beartooth N. F.

Sitanion minus J. G. Smith

Little squirrel-tail

RANGE: From Wash. to Cal. Collected also on the Hayden N. F. Range not yet known with precision.

DESCRIPTION: A small, densely tufted species. Stems erect, stiff, smooth or slightly rough or somewhat powdery-haired, about 6 to 8 in. high. Leaf-sheaths longer than the internodes, closely enveloping the stalks, smooth, the old sheaths usually numerous at the base of the stalks; leaf-blades very narrow, sharp pointed, somewhat rough on the edges, about 2 or 3 in. long. Spike slender, dense, 1 or 2 in. long, the base inclosed in the uppermost leaf-sheath. Spikelets 2-flowered, 2 together at each joint of the rachis, only one of them at each joint with fertile florets, the florets of the other reduced to awl-like awns. Glumes 4, awl-like or split into 2 awns from about the middle. Each lemma terminating in a slender, rough, somewhat twisting awn about 1 1-4 in. long.

HABITAT: Dry hills and rocky slopes, mostly above 5,000 feet. Collected on dry soil among sagebrush and on a dry sandy loam at elevations, respectively, of 6,000 and 9,000 ft. on the Mono N. F. Collected in Ranger District 4 on the Sequoia N. F., where it is reported as occurring between 8,000 and 12,000 ft.

FLOWERING PERIOD: More data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: Reported to be a good forage plant on the Mono N. F.

Sitanion molle J. G. Smith

Soft squirrel-tail

RANGE: Colo. (Utah?), Ariz. and w. centr. N. Mex.

DESCRIPTION: Stems stout, erect, rigid, 10 to 16 in. high, clothed at base with dead leaf-sheaths. Sterile shoots few, about 1-2 as long as flowering stems. Sheaths rather loose, open at throat, longer than the internodes, strongly pubescent. Blades rigid, erect or ascending, narrow, pubescent throughout, 3 to 6 in. long. Spike 2 to 3 1-2 in. long, erect, loosely flowered. Glumes 4, undivided or unequally 2-cleft, bristle-like, up to 3 in. long. Lemma hairless, smooth and shining, tipped with a stout, spreading, rough awn 2 to nearly 3 in. long. Very closely related to Montana squirrel-tail (*S. montanum*) but differs in being finely pubescent throughout and with longer and less strongly nerved leaves.

HABITAT: Moist, open mountain sides. Collected at 11,000 ft. in n. Colo. Collected on a decomposed granite at 6,000 ft. on the Prescott N. F.

FLOWERING PERIOD: More data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: Reported to be grazed by horses and cattle on the Prescott N. F.

Sitanion montanum J. G. Smith

Montana squirrel-tail

RANGE: From Oreg. to Mont., Wyo., Colo., n. Ariz. and Nev. Often abundant.

DESCRIPTION: Stems often rather stout, erect, 8 to 16 in. high, rougher above than below, from deep, strong, fibrous roots. Leaf-blades narrow, flat or inrolled, rigid, erect or ascending, pubescent on the back, rough on the margins and on the prominent nerves above; uppermost blade usually shorter than spike. Spike erect, loosely flowered, 2 to 4 in. long. Glumes awl-like, rough, long-awned. Lemmas rough above and on the margins, 3-cleft, the 3 awns rough and spreading, the lateral awns slender and short, the middle awn up to 2 3-4 in. long.

HABITAT: In sandy-gravelly soils between about 6,500 and 9,500 feet. Collected in a sandy loam at 7,500 ft. on the Ruby N. F., where it is reported to grow fairly thickly on open hillsides.

FLOWERING PERIOD: More data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: More data needed.

Sitanion multisetum J. G. Smith

Many-awned squirrel-tail

RANGE: From e. Oreg. to s. Idaho, Utah, Nev. and Cal.

DESCRIPTION: Stems smooth or somewhat roughish-pubescent, 12 to 20 in. high. Sheaths rather loose. Blades 2 to 4 in. long, rigid, erect or ascending, flat, becoming involute with age, sparse-hairy on the back, rough on margins, and rough and hairy along the prominent nerves above. Spike erect, 2 to 3 1-2 in. long. Glumes many (sometimes 12 or more) parted nearly to the base, the terminal awns usually from 2-5 to 2 in. long, rarely as much as 3 in. long, slender, rough and ascending. Lemmas 3-awned, the middle awn stout, rigid, rough, 1 3-4 to 2 1-2 in. long, the lateral ones much shorter and slender.

HABITAT: In the higher mountains.

FLOWERING PERIOD: More data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: More data needed.

Sitanion pubiflorum J. G. Smith

Downy-flowered squirrel-tail

RANGE: From s. Colo. through N. Mex. and Ariz. to s. Mex.

DESCRIPTION: Stems tufted, stout, rigid, erect, 6 to 14 in. high, with 3 to 5 stem-leaves. Leaves rigid, linear with edges rolled inward, the lowest 4 to 7 in., the uppermost 1-2 to 2 in. long, covered on the back with a fine and short, almost imperceptible down, rough above. Spike erect, 2 to 3 in. long; spikelets 2 1-2-flowered, the uppermost floret rudimentary; glumes bristle-like, 1 1-2 to 2 1-2 in. long; lemma of lowest floret tipped with a straight, erect, rough awn 2 to 2 1-2 in. long.

HABITAT: Widely distributed through the Y. P. type of the Southwest but occurring in the shade and on dry hills at elevations of from 2,000 to 7,500 feet.

FLOWERING PERIOD: May and June.

SEED DISSEMINATION: June to Sept.

FORAGE VALUE: Of little value, though some reports indicate that it is eaten to some extent when young and also when there is only a small amount of other green forage.

Sitanion rigidum J. G. Smith

Alpine squirrel-tail

RANGE: Wash. to Cal. and Wyo.

DESCRIPTION: A low, alpine plant, 4 to 8 in. high. Sheaths longer than the internodes; blades 1 to 3 1-2 in. long, rigid, involute, usually somewhat whitish.

Spike 4-5 to 3 1-4 in. long, exserted its own length or the base included in the uppermost leaf-sheath. Glumes 4 and undivided or else apparently 6 by the division to the base of the 2 lateral glumes, awned, strongly spreading, 4-5 to 1 1-5 in. long. Lemma 3-cleft, tipped with a short, stout, spreading awn 1-8 to 1-6 in. long. The scientific name *rigidum* refers to the rigid leaves.

HABITAT: In the higher mts., at subalpine to alpine elevations.

FLOWERING PERIOD: More data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: More data needed.

Sitanion rubescens Piper

Red-awned squirrel-tail

RANGE: Wash.

DESCRIPTION: Stems erect from a base somewhat bent at the lower nodes, smooth, about 2 ft. high; nodes brown. Sheaths mostly shorter than the internodes, smooth. Ligules absent or very greatly reduced. Blades flat, green, linear, narrowing to the abruptly pointed tips, 2 to 4 in. long, 1-8 to 1-5 in. wide, smooth above, rough on the rather prominent nerves beneath. Spikes long-exserted, straight or somewhat flexuous, erect, 3 1-5 to 5 1-5 in. long. Spikelets mostly 2 (rarely 3) at a joint, the lower or lateral ones 1 to 2-flowered, the lower 1 or 2 florets fertile. Glumes lance-shaped, 2 to 3-nerved, rough on the nerves, 1-4 to 7-25 in. long, bearing stout, spreading, rough awns 2-5 to 4-5 in. long, or rarely 2-cleft and bearing in addition a short lateral awn. Lemma lance-shaped, 2-5 to 1-2 in. long, smooth and shining below, rough above, 3 to 5-nerved, bearing a stout, straight or wavy, roughish, purplish-red awn 3-5 to 2 in. long. Palea equalling the lemma in length. Internodes of rachis spatula-shaped, flattened, rough on the margins, 1-4 to 1-3 in. long.

HABITAT: Dry, rocky mountain slopes, mostly at the higher elevations.

FLOWERING PERIOD: More data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: More data needed.

Sitanion velutinum Piper

Velvety squirrel-tail

RANGE: From e. Wash to e. Oreg.

DESCRIPTION: Stems erect, rigid, 12 to 16 in. high, covered with dense, very fine hairs. Sterile shoots few and short. Leaf-sheaths longer than the internodes, fitting the stems rather closely, open at the throat, covered with dense, fine, velvety hairs, to which the scientific name *velutinum* ("velvety") refers. Leaf-blades flat, lance-shaped, gradually narrowing from the base to the apex, abruptly sharp-pointed, erect or spreading, covered on both sides with dense and very fine hairs; stem-blades 3 or 4, the lower 2 1-4 to 4 in. long, the upper 2-5 to 1 3-5 in. long. Ligule absent. Spikes completely exserted from the leaf-sheaths, stiffly erect, 1 3-5 to 3 1-5 in. long without the awns. Spikelets 2 (rarely 1) at each node of the rachis, the lower 1 or 2-flowered and frequently sterile, the upper 2 to 4-flowered, 1 to 3 of the florets fertile. Glumes awl-shaped, fine-hairy, 1-5 to 7-25 in. long, for the most part whole and undivided, but 1 or 2 often cleft and bearing a short, lateral awn, rarely cleft to the base, each cleft tipped with a rough, spreading awn about 1 or 2 in. long. Lemmas lance-shaped, densely fine-haired, less than 1-2 in. long, 3-nerved above, 3-cleft at apex, the lateral lobes 1-25 in. long, the stout awns about 1 to 2 in. long. Palea as long as lemma, sharp-pointed, rough on the nerves. Internodes of rachis linear to club-shaped, 1-6 to 1-4 in. long, slightly roughened on the upper margins. Also known as White foxtail.

HABITAT: Often common in rather poorly disintegrated soils on the higher range at or near timber-line, usually in open glades.

FLOWERING PERIOD: July on the Wallowa N. F.

SEED DISSEMINATION: On the Wallowa N. F. it is reported that seed ripen from the middle of Aug. to the first of Sept., but that they are not usually dispersed until several weeks thereafter.

FORAGE VALUE: The troublesome awns produced at an early date, combined with toughness of foliage and abundance, make this species a pest on the bunchgrass ranges of e. Oreg. and e. Wash.

Sitanion villosum J. G. Smith

Shaggy squirrel-tail

RANGE: Wash. to Cal.

DESCRIPTION: Stems stout, erect or slightly bent at base, 8 to 12 in. high, densely leafy at base, forming close, matted tufts. Sheaths rather densely hairy. Blades short, flat or becoming inrolled with age, rigid, ascending or spreading, more or less densely-hairy, rough along the dry and thickened margins, 1 3-5 to 3 1-5 in. long. Spikes about as long as leaf-blades, the base inclosed in the greatly elongated uppermost leaf-sheath. Glumes divided into 3 to 8 spreading awns 1 to 3 in. long. Lemmas 3-awned, smooth and shining at the base, rough for the upper 2-3, the middle awn stouter and about 10 times longer than the lateral awns, sometimes as much as 4 in. long.

HABITAT: Rocky hilltops, dry, gravelly prairies, and in other well-drained situations.

FLOWERING PERIOD: More data needed.

SEED DISSEMINATION: More data needed

FORAGE VALUE: Good, especially for cattle and horses, before and after seed production, the awns being bothersome to stock. It is reported to be the most abundant of the principal grasses of Inyo County, Cal., and that it stays green longer than the others.

SORGHASTRUM

The genus *Sorghastrum* is a member of *Andropogoneae*, the Beard-grass tribe of the Grass family. There are about 12 species in temperate and tropical countries. The genus *Sorghastrum* is characterized by: Spikelets sessile at each joint of the slender rachis of the peduncled racemes, which are reduced to 2 or 3 joints; the sterile spikelets reduced to hairy pedicels; glumes hardened, sterile lemma thinly transparent, the fertile lemma reduced to transparent appendages to the strong awn; palea obsolete.

Sorghastrum nutans (L.) Nash

Indian grass

Chrysopogon nutans (L.) Benth.

Andropogon nutans avenaceus (Michx.) Hack.

RANGE: Me. to Man., Fla., Ariz. and Mex.

DESCRIPTION: A perennial with unbranched, erect stems 3 to 8 ft. tall, smooth, with hairy nodes. Leaves up to 2 ft. in length, 1-6 to 2-3 in. wide, tapering to a point, rough. Panicle 4 to 12 in. long, the branches 2 to 4 in. long, slender, erect-spreading; spikelets in pairs or in 3's at the ends, about 1-4 to 1-3 in. long; awn

twisted, bent twice, about 2-5 to 5-6 in. long. Known also as Bushy bluestem and Wood-grass.

HABITAT: Generally in dry soil though it thrives best on rich prairie bottoms.

FLOWERING PERIOD: July to Sept.

SEED DISSEMINATION: Aug. to Oct.

FORAGE VALUE: In the East and South this grass is not much valued; in the Prairie States it is greatly esteemed for hay, all stock eating it greedily when cut early in the season. In S. Dak. it is often considered the most important hay-species. Chemical analyses show it to be very nutritious.

Sorghum halepense (L.) Pers. See *Holcus halepensis* L.

SPHENOPHOLIS

A member of *Aveneae*, the Oat tribe of grasses. There are about 6 species, all confined to N. Am. The genus *Sphenopholis* is characterized as follows: Tufted perennials; spikelets 2 or 3-flowered, jointed below the glumes, the rachilla extending beyond the uppermost floret as a slender pedicel; lemma papery, awnless or awned from below the summit, the nerves obscure.

Sphenopholis obtusata (Michx.) Scribn.

Prairie-grass

Eatonia obtustata (Michx.) Gray

RANGE: From Me. to Wash., Ariz. and Fla. The variety *S. obtusata lobata* extends into Cal.

DESCRIPTION: Stems smooth, erect, often stout, unbranched, 1 to 3 ft. high. Leaves 1 to 9 in. long, 1-12 to 1-3 in. wide, rough. Panicle 2 to 6 in. long, dense, generally spike-like, straight, erect, the branches 1 1-2 in. long or less, erect; spikelets crowded 1-10 to 1-8 in. long. Known also as Early bunchgrass.

HABITAT: Occurs in dry soils but does best in moist situations.

FLOWERING PERIOD: Mar. to Aug.

SEED DISSEMINATION: May to Sept.

FORAGE VALUE: Of fine quality, very tender and grazed with great relish by all classes of stock; it is one of the earliest grasses to appear in the spring, and usually produces a fair amount of foliage but seldom occurs abundantly. Wherever it occurs in any quantity it is valuable as forage. It is well worthy of cultivation.

SPOROBOLUS

Sporobolus is a member of *Agrostideae*, the Redtop-Timothy tribe of grasses. There are approximately 80 species in tropical and temperate regions, being very numerous in America. The genus *Sporobolus* is characterized by: 1-flowered, awnless, spikelets in narrow and spike-like, or loose and spreading panicles; lemma as long as or longer than the glumes; palea as long as or longer than the lemmas; grain readily falling from the spikelet. They are annuals or perennials. Many of the species of *Sporobolus* are very palatable and nutritious and often produce an abundance of foliage.

Sporobolus airoides Torr.

Alkali sacaton

RANGE: From Mont. to Oreg., Cal., Tex. and Nebr.

DESCRIPTION: A densely tufted perennial, forming large tussocks, with smooth, stout stems spreading at the base, 1 to 3 ft. high. Sheaths smooth, sparsely hairy

at the throat; blades smooth beneath, rough above, 1-12 to 1-8 in. wide at the base, tapering into a long, slender, inrolled point, the basal leaves about 1-2 as long as the stem, the upper stem leaves 2 to 5 in. long. Panicle 5 to 15 in. long, after flowering the branches widely spreading; spikelets 1-16 to 1-12 in. long. Known also as Big plume bunchgrass, Fine-top salt-grass, and Hair-grass dropseed.

HABITAT: Bottomlands, valleys, prairies and rocky sites, often in alkaline soil, at elevations to 11,000 feet.

FLOWERING PERIOD: July to Sept.

SEED DISSEMINATION: Aug. and Sept.

FORAGE VALUE: Generally too coarse to be a valuable forage grass though eaten quite freely by cattle and horses when green and tender and when other forage is scarce. It often occurs in abundance on saline areas where little other forage will grow and if kept closely grazed it makes very good pasturage.

Sporobolus asperifolius Nees and Meyen Rough-leaved dropseed

RANGE: From Sask. and Brit. Col. s. to Mo., Cal. and Tex. and in the mts. to S. Am.

DESCRIPTION: A perennial from creeping rootstocks with stems 1-2 to 2 ft. long, ascending or from a creeping or decumbent base. Sheaths smooth, keeled; blades rough, flat, 1 to 2 in. long and about 1-12 to 1-8 in. wide. Panicle 2 to 8 in. long, usually slightly included at the base by the uppermost sheath, the slender branches spreading or ascending; spikelets about 1-16 in. long. Known also as Rough-leaved salt-grass.

HABITAT: On dry and strongly alkaline soils to elevations of about 8,000 ft. in Utah.

FLOWERING PERIOD: June to Sept.

SEED DISSEMINATION: July to Oct.

FORAGE VALUE: Somewhat palatable to all classes of stock and since it often occurs abundantly in strongly alkaline soils where better forage plants will not grow it is of some importance.

Sporobolus brevifolius (Nutt.) Scribn. See *Muhlenbergia cuspidata* (Torr.) Rydb.

Sporobolus buckleyi Vasey Buckley's dropseed

RANGE: W. Tex., s. N. Mex. and e. Mex.

DESCRIPTION: A perennial with rather stout, erect, leafy, solid stems 2 to 3 ft. high. Leaves flat, usually 1 to 2 ft. long, narrow, terminating in a long slender point. Panicle open 6 to 15 in. long with the long, slender branches spreading or ascending and bearing numerous, small spikelets on the upper 2-3.

HABITAT: More data needed.

FLOWERING PERIOD: July. More data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: Reported "poor" from the Gila N. F., but it is thought that the very young specimens submitted were responsible for this opinion in some degree; more data are desired.

Sporobolus confusus (Fourn.) Vasey Tufted annual dropseed

RANGE: From Wash. to Mont., Nebr., w. Tex. and Cal. and s. in the mts. to s. Mex.

DESCRIPTION: A tufted annual with slender stems 3 to 12 in. high, often poorly developed. Leaves 2 1-2 in. or less in length and less than 1-16 in. wide. Panicle

open, 1 to 8 in. long the slender branches spreading or ascending; spikelets 1-24 to 1-16 in long.

HABITAT: Open sandy or gravelly and usually moist areas to elevations of about 9,500 feet.

FLOWERING PERIOD: July to Sept.

SEED DISSEMINATION: Aug. and Sept.

FORAGE VALUE: The larger plants are grazed to some extent but the usually short stature, short growth period and scattering occurrence make it of very little importance.

Sporobolus cryptandrus (Torr.) Gray

Sand dropseed

RANGE: From Mass. to Wash., Oreg., Utah, Ariz., n. Mex. and Pa.

DESCRIPTION: A tufted perennial with erect, smooth, rather stout stems 1 1-2 to 3 1-2 ft. high. Sheaths overlapping, hairy on the margin and with a dense hairy ring at the summit; blades 3 to 6 in. long, 1-12 to 1-6 in. wide, flat, smooth beneath, rough above. Panicle 5 to 10 in. long, the base generally included in the upper sheath, the branches spreading or ascending; spikelets 1-12 to 1-10 in. long.

HABITAT: Sandy plains and ridges to elevations of 8,000 feet.

FLOWERING PERIOD: July to Sept.

SEED DISSEMINATION: Aug. to Oct.

FORAGE VALUE: Generally succulent, very palatable and nutritious, to all classes of stock. It is widely distributed and where abundant is regarded as an important forage plant.

Sporobolus cryptandrus strictus Scribn. See *S. strictus* (Scribn.) Merr.

Sporobolus depauperatus (Torr.) Scribn. See *Muhlenbergia squarrosa* (Trin.) Rydb.

Sporobolus filiformis (Thurb.) Rydb. See *Muhlenbergia filiformis* (Thurb.) Rydb.

Sporobolus giganteus Nash

Giant dropseed

RANGE: Only known from s. N. Mex. and s. e. Ariz.

DESCRIPTION: A smooth, somewhat tufted perennial with stout stems erect from a usually decumbent base, 3 to 5 ft. high and about 2-5 in. thick at the base. Sheaths crowded and overlapping, ridged, loose, hairy on the margins, and with a tuft of hairs on each side of the summit, the uppermost sheath elongated and enclosing the greater part of the panicle. Leaves erect 8 to 20 in. long, about 2-5 in. wide at the base, tapering into a long slender point. Panicle yellowish-white, shining, erect, narrow and spike-like, rigid, 6 to 20 in. long, 1-4 to 2-5 in. thick, the branches erect and pressed close to the axis; spikelets numerous, about 1-8 in. long.

HABITAT: Sandy hills.

FLOWERING PERIOD: More data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: More data needed.

Sporobolus gracillimus (Thurb.) Vasey. See *Muhlenbergia filiformis* (Thurb.) Rydb.

Sporobolus heterolepis Gray

Prairie dropseed

RANGE: From w. Que. to Sask., s. to Conn., Pa., Mo., Tex. and Colo.

DESCRIPTION: A tufted perennial with a rather stout, erect, wiry stem 2 to 3 ft.

high. Leaves narrow, inrolled, bristle-like, the basal 1-2 as long as the stem. Panicle 3 to 10 in. long, open and loose; spikelets 1-6 to 1-4 in. long.

HABITAT: Dry soil; especially prairies.

FLOWERING PERIOD: Aug. and Sept.

SEED DISSEMINATION: Sept. and Oct.

FORAGE VALUE: Palatable to all classes of stock and often abundant in the Prairie region. In centr. and w. Iowa it is considered the most important of the species of *Sporobolus* that occur there.

***Sporobolus interruptus* Vasey**

Black sporobolus

RANGE: In Ariz. on the Colo. plateau s. of Flagstaff and in the White Mts.

DESCRIPTION: A tufted perennial from a strong, creeping rootstock, forming a sod, with solid, erect, unbranched stems 16 to 30 in. high. Leaves bright green and turning a yellowish green when frosted, mostly basal, flat or folded, 3 to 6 in. long or longer, 1-12 to 1-6 in. wide. Panicle terminal, 4 to 7 in. long, narrow, but loosely flowered; spikelets large, about 1-5 to nearly 1-3 in. long.

HABITAT: Occurs on the Coconino N. F. in timber and parks in the lower limits of the Y. P. type and the upper limits of the woodland type at elevations of 6,500 to 7,000 feet.

FLOWERING PERIOD: July and Aug.

SEED DISSEMINATION: Aug. and Sept.

FORAGE VALUE: One of the most palatable and nutritious grasses. It is sought out in preference to blue grama even when it occurs in scattered clumps in a nearly pure stand of blue grama. It is always grazed very close wherever accessible. It produces an abundance of foliage which becomes green early in the spring. Experiments are being conducted to extend its range.

***Sporobolus jonesii* Vasey.** See *Muhlenbergia jonesii* (Vasey) Hitchc.

***Sporobolus ligulatus* Vasey & Dewey**

Spiked sporobolus

RANGE: W. Tex. and s. N. Mex.

DESCRIPTION: A perennial from a knotted rootstock, with smooth unbranched, slender, erect stems, 12 to 20 in. high. Basal leaves numerous, very narrow, flat or the edges inrolled, smooth or very nearly so, 4 to 12 in. long; the stem leaves 2 or 3, the sheaths about as long as the internodes, the sheath of the upper leaf extending nearly to the panicle. Panicle loosely spike-like or interruptd 3 to 6 in. long; spikelets 1-8 to 1-6 in. long.

HABITAT: More data needed.

FLOWERING PERIOD: Sept. More data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: More data needed.

***Sporobolus racemosus* Vasey.** See *S. ramulosus* (H. B. K.) Kunth.

***Sporobolus ramulosus* (H. B. K.) Kunth**

Red annual dropseed

S. racemosus Vasey

RANGE: Colo., Ariz. and southw. in the mts. to s. Mex.

DESCRIPTION: A reddish, slender, erect or decumbent, freely branching annual, 2 to 14 in. high. Leaves 4 to 7 in number, thin, flat or inrolled, 3-4 to 13-4 in. long, narrow. Panicles terminal and lateral, open, 1 to 3 in. long, branches, few-

flowered; spikelets on short, rather thick pedicels; glumes smooth, usually nearly equal and very short about 1-50 in. long.

HABITAT: Along creek beds in moist places.

FLOWERING PERIOD: July to early Sept.

SEED DISSEMINATION: Aug. and Sept.

FORAGE VALUE: The larger plants are probably grazed to some extent but the usually low habit, short growth period and scattering occurrence make it of little, if any, importance.

Sporobolus repens Presl. See *Muhlenbergia repens* (Presl) Hitchc.

Sporobolus richardsonis (Trin.) Merr. See *Muhlenbergia richardsonis* (Trin.) Rydb.

Sporobolus strictus (Scribn.) Merr.

Erect dropseed

S. cryptandrus strictus Scribn.

RANGE: Kans. to Nev. and s. to n. Mex.

DESCRIPTION: A tufted perennial with smooth, erect, rather stout stems 1 1-2 to 3 1-2 ft. high. Sheaths overlapping, hairy on the margin and with a dense hairy ring at the summit; blades 3 to 6 in. long, 1-12 to 1-16 in. wide, flat, smooth beneath, rough above. Panicle 6 to 12 in. long, narrow, straight, erect, densely flowered, with permanently erect branches.

HABITAT: More data needed.

FLOWERING PERIOD: More data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: Probably palatable and nutritious to all classes of stock. More data are desired.

Sporobolus tricholepis Torr. See *Blepharoneuron tricholepis* (Torr.) Nash.

Sporobolus utilis Torr. See *Muhlenbergia repens* (Presl) Hitchc.

Sporobolus wrightii Munro

Sacaton

RANGE: Ariz. to w. Tex. and s. Mex.

DESCRIPTION: A very stout, erect, tufted, perennial 2 to 6 ft. high. Leaves in-rolled, long pointed, 1 to 2 ft. long. Panicle 1 to 2 ft. long, erect, the branches spreading, 4 to 8 in. long; spikelets 1-12 to 1-10 in. long.

HABITAT: Low alluvial bottoms or flats subject to flooding, between 3,000 and 6,000 feet. It can withstand considerable drought.

FLOWERING PERIOD: June to Sept.

SEED DISSEMINATION: Aug. to Oct.

REPRODUCTION: Produces a large amount of comparatively viable seed.

FORAGE VALUE: Readily grazed by cattle and horses when young and if cut at the proper time and thoroughly cured it furnishes coarse but palatable, nutritious hay. Also makes good winter range.

STIPA

Stipa is a large genus, widely distributed but chiefly in tropical and temperate regions, consisting of about 100 species, approximately one-third of which occur in N. Am., mostly in the Southwest, Cal. and Ariz., with about 15 species each, being the center of distribution. Alaska has 1 species; Wash., 8; Mont., 9; N. Mex., 10; Colo., 12, and Mex., 17.

Members of this genus are tufted perennials, with very narrow or inrolled leaves and usually open panicles, belonging to the *Agrostideae*, Redtop-Timothy tribe of the Grass family. The spikelets are 1-flowered, the rachilla jointed above the glumes and prolonged below the lemma into a strong-bearded, conical, sharp-pointed "callus" or roughened spot. The glumes are thin, membranous, nearly equal in length, sharp-pointed or bristle-tipped. The lemma is narrow, thickened, closely rolled around the flower and palea, and terminates in the characteristic twisted and bent awn, which is articulated with the lemma. The awn is persistent or but tardily separating from the lemma. The palea is usually shorter than the lemma. The grain is cylindrical and closely enveloped by the hardened fruiting lemma.

Stipas are known ordinarily as Porcupine-grasses or Needle-grasses.

Stipa comata Trin. & Rupr.

Needle-and-thread

RANGE: Widely distributed, from the upper valley of the Yukon River in Alaska and Yukon southw. to Cal., Ariz., N. Mex., Kans. and Iowa. The only species of the genus known to occur in Alaska, and also the only one so far submitted from all six U. S. F. S. districts.

DESCRIPTION: Erect, rather stout, leafy, smooth, 1 to 4 ft. high. Leaf-sheaths mostly crowded at the base; uppermost sheath usually loose, as if inflated, very long, inclosing the base of the panicle. Basal leaf-blades narrow, inrolled, 3 to 12 in. long; stem leaf-blades 3 to 6 in. long, a little broader than the basal ones, but inrolled. Panicle 5 to 10 in. long, loose, the branches 2 to 5 in. long, erect or ascending and destitute of spikelets toward the base. Glumes relatively very long, from 3-4 to 1 in., smooth, narrow and tapering into slender, fragile awns 1-6 to 1-3 in. long. Lemma about 1-3 to 1-2 in. long, bearing a long, slender awn, 2 to 9 in. long, the lower part of which is closely twisted and somewhat pubescent and the upper part, above the bend, rough to the touch and either straight or only slightly twisted. Also called Long-awned porcupine-grass, Common needle-grass, and Silk-grass.

HABITAT: Dry sandy or gravelly soils on plains or hills. In the Great Plains region and on the foothills and drier mesas of the Rocky Mt. region it is often common. Between 4,000 and 8,500 ft. in Colo. (fid. Rydberg). Collected at 8,400 ft. on the Manti N. F. and between 7,200 and 7,600 ft. on the Targhee N. F., where it occurs scatteringly in dry soils in sage areas and in the Y. P. type.

FLOWERING PERIOD: May to July.

SEED DISSEMINATION: July to Sept.

FORAGE VALUE: Injurious, especially to sheep, when the seed heads are developed. However, it comes up very early in the spring and is palatable to all classes of stock at that time and, as it long remains green, it often affords good grazing to cattle and horses late in the season when the seeds have been disseminated. Reported from the Manti and Targhee N. F. that the "foliage is too coarse to be very palatable, but it is probably grazed to a limited extent in spring and fall." The stockmen of e. Wyo., where it is plentiful, consider this valuable forage before heading and it is held in high esteem there for hay. In parts of the Dakotas and in Nebr. also, it is often cut for hay. It is stated that, in parts of n. N. Mex. the species is in danger of extermination because of the fact that it is so closely grazed in the spring and early summer and is not given a chance to seed.

Stipa comata intermedia Scribn. See *S. tweedyi* Scribn.

***Stipa coronata* Thurb.**

California porcupine-grass

RANGE: In Cal., from Monterey and Tulare Cos. s. into Lower Cal. (Also in e. Ariz.?)

DESCRIPTION: Stems stout, erect, 4 to 6 ft. high, as much as 1-4 in. thick at the base, smooth or pubescent below the nodes. Leaf-sheaths hairless except on the margins and throat; leaf-blades elongated, flat but with slender, involute points, the lower ones often 3 ft. long and erect. Panicle narrow, rather densely flowered, stout, purplish, 12 to 18 in. long. First glume 2-3 to 5-6 in. long, longer than the second glume; lemma 1-3 in. long, clothed with dense, silky hairs, those above being about 1-6 in. long, or about twice as long as the others, forming a sort of "corona" or crown to which the scientific name *coronata* refers. Awn twice-bent, slender, roughish but not hairy, about 1 in. long. Known also as Crested needle-grass and Long-leaved porcupine-grass.

Dr. Thurber in his original description of this species (in Wats. Bot. Cal. 2: 287. 1880) refers to it as follows: "The tallest and most robust (?) of all N. Am. Stipas; when young, with the panicle partly included, it appears somewhat like *S. stillmani* (Stillman's porcupine-grass, a large, peculiar species, with thick roots and handsome, shining panicles, known only from Placer Co., Cal.) but it lacks the marked and peculiar lustre of that species. Later the panicle is exserted, becoming wider and loose and taking on a purplish tinge, and the resemblance is no longer noticed. The remarkably long hairs upon the floret have a peculiar silvery lustre; when highly magnified each hair is seen to be flat and spirally twisted."

HABITAT: Mostly sandy plains and hillsides.

FLOWERING PERIOD: Feb. to July.

SEED DISSEMINATION: May to Sept.

FORAGE VALUE: More data needed.

***Stipa elmeri* Piper & Brodie**

Elmer's porcupine-grass

RANGE: Wash. to w. Mont., n. w. Wyo., Nebr. and Cal.

DESCRIPTION: From 2 to 3 ft. high, minutely pubescent, especially at the nodes and on the leaf-sheaths. Leaf-blades flat or becoming involute. Panicle narrow but rather loose, 6 to 15 in. long. Glumes about twice as long as lemma. Awns distinctly twice-bent, feathery-pubescent as far as the 2d bend, 1 to 1 1-2 in. long. It greatly resembles the well-known Green porcupine-grass (*S. viridula*) in some respects its e. equivalent, and of which, in fact, it was long considered a variety, but differs in its pubescent stems and leaf-sheaths and in its feathery-pubescent awns. Very close also to Williams' porcupine-grass (*S. williamsii*) but distinguishable by its feathery-pubescent awns.

HABITAT: Characteristically in rather dry, open situations at medium or lower elevations in the mts.; collected at 3,500 ft. on a volcanic ash soil, Shasta N. F.; collected in a wet meadow at 6,700 ft. in the Yellowstone Nat. Park.

FLOWERING PERIOD: More data needed. About May and June, Shasta N. F.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: More data needed. Observed in scattering stand on a sheep range, in a *Kunzia-Chrysothamnus-Eriogonum* association, Shasta N. F., where it was grazed with fair relish early in the season. Probably more palatable to horses and cattle than to sheep.

***Stipa eminens andersonii* Vasey**

Anderson's porcupine-grass

RANGE: Wholly in Cal., from Mt. Shasta southw. through the Sierra Nevada and, in the Coast Range, from Berkeley Hills to San Diego.

DESCRIPTION: A variety of Cavanilles' porcupine-grass (*S. eminens*) from typical forms of which it differs mainly in its smaller size (about 1 to 2, instead of 2 to 3 ft.), slender and involute, instead of flat leaf-blades, narrower and fewer-flowered panicles, and usually smaller spikelets.

HABITAT: Dry, rocky hillsides and the like.

FLOWERING PERIOD: More data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: More data needed.

***Stipa fimbriata* H. B. K.** See *Oryzopsis fimbriata* (H. B. K.) Hemsl.

***Stipa kingii* Bolander.** See *Oryzopsis kingii* (Bolander.) Beal.

***Stipa lemmoni* (Vasey) Scribn.**

Lemmon's porcupine-grass

S. pringlei lemmoni Vasey

RANGE: Wash. to Cal.

DESCRIPTION: From 1 1-2 to 3 ft. high; leaf-sheaths often slightly hairy at the throat; leaf-blades 2 to 4 in. long, but those of the sterile shoots much longer, usually flat, sometimes becoming involute, and usually pubescent on the upper surface. Panicle narrow, rather few-flowered, the branches erect or nearly so and about 1 or 2 in. long. Glumes 1-2 in. long, much longer than the lemma. Awn 1-2 to 1 in. long, twice-bent, clothed to the 2d bend with rather sparse, appressed, short hairs.

HABITAT: Usually in dry, open situations in the mountains.

FLOWERING PERIOD: More data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: Usually regarded as a valuable forage plant prior to heading.

***Stipa lemmoni jonesii* Scribn.**

Jones' porcupine-grass

RANGE: Wash., Idaho, Oreg. and Cal.

DESCRIPTION: Differs from typical forms of the species, Lemmon's porcupine-grass (*S. lemmoni*) in the more slender, involute blades and smaller spikelets; glumes are 1-3 in., instead of 1-2 in. long as in the species; awn about 3-4 in., instead of 1 in. long as in the species, and tending to be incurved and with shorter pubescence.

HABITAT: About the same as that of the species. Collected on a dry, gravelly-rocky, slatey ridge, in the Y. P. type, on the boundary between the Shasta and Trinity National Forests, at an elevation of 4,900 ft.

FLOWERING PERIOD: More data needed. About May and June, Shasta N. F.

SEED DISSEMINATION: More data needed. Mainly middle of July to about Sept. 1 on the Shasta N. F.

FORAGE VALUE: More data needed. On the Shasta N. F. it is reported that the plant "has an abundance of basal leaves and a deep and strong root system; it is palatable both to cattle and sheep early in the season but becomes wiry and unpalatable to sheep from about July on."

***Stipa lettermani* Vasey**

Letterman's porcupine-grass

RANGE: From Mont. to Wash. and from Colo. to Cal.

DESCRIPTION: Stems smooth, slender, wiry, often tinged with purple at base, 8 to 24 in. high; sheaths smooth; blades usually crowded at base of plant, 2 to 4 in. long, erect or ascending, slender and inrolled. Panicle narrow and slender, erect

or nearly so, short-exserted, few-flowered and interrupted, 2 to 8 in. long. Glumes narrow, tapering, 3-nerved, 1-3 in. long. Lemma narrow, hairy, about 1-5 in. long; awn not feathery, very slender, twisted, twice-bent, from 1-2 to 1 in. long. Resembles somewhat the common Green porcupine-grass (*S. viridula*) but more slender and with smaller spikelets and shorter awns.

HABITAT: Dry soils, in canyons and on hillsides and plains. It occurs in Mont. (fid. Rydberg) on dry hills at about 6,000 to 7,000 ft. On the Medicine Bow N. F., usually in dry parks at subalpine elevations. Collected at 7,250 ft. on the Manti N. F., where it is stated to be "common in dry soil, sage and woodland type." Common on the Eldorado N. F. in granitic formations between about 7,000 and 9,000 feet. Known also as Letterman's hair-grass.

FLOWERING PERIOD: Mainly July and Aug.

SEED DISSEMINATION: Sept. and Oct.

FORAGE VALUE: One of the prairie hay grasses. Reported from the Medicine Bow N. F. as a valuable constituent of the forage of the drier mountain parks. Stated to be very important spring forage, on the Manti N. F., especially on the lambing grounds, and one of the most valuable grasses in the sage and woodland types. It is one of the most important high range plants on the Eldorado N. F.; it remains green until the snows come and is especially palatable to cattle; the awns are so short and fine that it is improbable that they cause stock any uneasiness.

***Stipa minor* (Vasey) Scribn.**

Subalpine porcupine-grass

RANGE: From Wash. to Mont. and southw. to Cal. and n. N. Mex. One of the 3 commonest *Stipas* on N. F. ranges.

DESCRIPTION: Smooth, sometimes densely tufted, erect, 16 to 36 in. high. Leaf-sheaths smooth; leaf-blades slender, flat or involute, 4 to 12 in. long. Panicle narrow, 3 to 8 in. long. Awn 1-2 to 1 1-2 in. long, nearly smooth, twisted, twice-bent, often purplish. Differs from Letterman's porcupine-grass (*S. lettermani*) only in being larger, the blades more scattered, flat or tardily involute, and the panicle longer. Also known as Lesser *stipa* and Hair-grass.

HABITAT: Dry soils, usually occurring in the central Rocky Mts. at subalpine or alpine elevations or between about 8,000 to 12,500 feet. Collected on the Lewis & Clark N. F. on a dry, gravelly s. slope at 5,100 feet. Collected at 9,350 ft. on the Manti N. F., where it is reported to be "very common in aspen, grass and conifer types. Often predominating grass." Collected on lava beds at 5,000 ft. on the Modoc N. F.

FLOWERING PERIOD: June to Aug. "July to Aug. 15," Medicine Bow N. F.

SEED DISSEMINATION: Aug. and Sept.

FORAGE VALUE: Very good forage for all classes of stock, particularly early in the season before heading and again, later in the season, when it remains green after most other grasses have dried and bleached. A nutritious grass as well. On the Manti N. F. it is reported to be "good forage before the foliage gets tough."

***Stipa nelsoni* Scribn.**

Nelson's porcupine-grass

RANGE: From Wash. and Oreg., through Idaho and Utah, to Wyo. and Colo. The range is not yet known with precision and it is possible that Alb., Sask. and Mont. should also be included in the range.

DESCRIPTION: Smooth, stout, usually in small tufts, 2 to 4 ft. high. Leaf-sheaths smooth, streaked, the overlapping margins soft-hairy; leaf-blades long, narrow, flat or inrolled. Panicle very narrow and spike-like, rather densely-flow-

ered, sometimes over 1 ft. long and having a silvery appearance due to the glumes, which are very thin and translucent and about 2-5 in. long. Lemma silky-haired, shorter than glumes, bearing a roughish, slender, usually twice-bent awn, 1.4 to 2.4 in. long.

HABITAT: In dry, subalpine situations. Collected in a dense stand, very sandy soil, gentle n. slope, on the Pike N. F. at 7,800 ft.; found between 7,500 to 10,000 ft. in Colo. (fid. Rydberg). In Wyo. it is reported to be most luxuriant in the wooded, mountain areas, on summer ranges, but also occurs scatteringly in the desert ranges.

FLOWERING PERIOD: More data needed. About June on the Pike N. F.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: Reported to be good feed for cattle and horses in the forepart of the season. Further notes are desired.

***Stipa neomexicana* (Thurb.) Scribn.**

New Mexican feather-grass

RANGE: From s. Colo. to Ariz., N. Mex. and w. Tex.

DESCRIPTION: Erect, rather stout, densely tufted, 1 to 3 ft. high. Leaves in-rolled, 6 to 12 in. long. Panicle ornamental, narrow, receme-like, usually 3 to 6 in. long, although lengths of about 1 ft. have been reported. Glumes nearly equal, about 1 to 1 1-2 in. long, 5 to 7-nerved. Lemma 2-5 to 3-5 in. long, with close, appressed pubescence; awn feathery except at the base, 2 to 4 1-2 in. long. Known also as New Mexican needle-grass.

HABITAT: Dry hills up to about 6,000 ft. in Colo.; sandy mesas and to some extent in the high mts.; "abundant" in parts of N. Mex.

FLOWERING PERIOD: Apr. to July.

SEED DISSEMINATION: June to Sept.

FORAGE VALUE: More data desired. It would appear (Univ. Ariz. Agr. Expt. Sta. Bull. 65, p. 268) that this species has forage value in the spring in certain parts of Ariz. In N. Mex. Agr. Expt. Sta. Bull. 81, pp. 57 and 58, it is reported that the species is probably in danger of extermination in parts of that State because of its being grazed so closely in the forepart of the season that seed cannot be produced.

***Stipa occidentalis* Thurber, in U. S. Geol.**

Western porcupine-grass

Explor. 40th Par. 5: 380. 1871.

Not *S. occidentalis* Thurber in Wilkes U. S. Explor. Exped. 17: 483. 1874, which is *S. thurberiana* Piper.

RANGE: Wash., Oreg. and w. Idaho to Cal. and Nev. (Wyo. also ?).

DESCRIPTION: Often deeply rooted; slender-stemmed, 1 to 2 1-2 ft. high. Leaves slender, mainly basal; sheaths smooth; blades involute. Panicle narrow and almost spike-like, 4 to 9 in. long. Glumes 1-3 to 5-12 in. long, smooth. Lemma 1-4 in. long, long-hairy, sharp-pointed at the base; awn feathery, twice-bent, 1 to 1 2-5 in. long.

HABITAT: Usually dry, well-drained soils in open situations. Often common on plains, foothills and rocky banks. Very luxuriant on a volcanic ash, at about 3,900 ft., on the Shasta N. F. Quite drought-resistant; in tests conducted on the Wallowa N. F. death resulted when the soil moisture content was reduced to as low as from 9.4 per cent to 11.6 per cent.

FLOWERING PERIOD: May to Aug. About July 15 to Aug. 15 on the Wallowa N. F.

SEED DISSEMINATION: July to Oct. Late Aug. to late Sept. on the Wallowa N. F.

REPRODUCTION: Of fair seed-viability; the average for 3 tests made on the Wallowa N. F. was 27 per cent.

FORAGE VALUE: In the forepart of the season palatable to both sheep and cattle on the Shasta N. F., but it tends to get rather wiry and unpalatable with age, at least for sheep. On the Wallowa N. F. the leaf-blades were noticed to remain green until about Sept. 1, the plant being grazed by sheep, cattle and horses but considered of most value for sheep. Sheep do not consume the flower-stalks but graze the blades closely, leaving the stalks naked.

***Stipa pringlei* (Beal) Scribn. 1892**

Pringle's porcupine-grass

. *Oryzopsis pringlei* Beal. 1890.

Not *Oryzopsis pringlei* Scribn. 1896

RANGE: Known originally from Chihuahua, Mex.; it occurs also in w. Tex., in the Mogollon Mts. of N. Mex. and in Ariz. Reported from s. Cal., but doubtful.

DESCRIPTION: Stems tufted, erect, 2 to 3 1-2 ft. high. Leaf-blades mostly flat, rather rigid, coarsely nerved, smooth or rough, about 5 to 12 in. long. Panicle relatively few-flowered, rather loose and open, 4 to 8 in. long, the branches 1 to 3-flowered, usually naked below. Spikelets 1-3 to 2-5 in. long, exclusive of the awns; lemma nearly as long as glumes, sparsely hairy. Grain, when mature, thickened and turgid, about 1-2 in. long, dark-colored, covered with short, brown hairs; awn slender, spirally twisted, rough to the touch but not feathery, about 4-5 in. long.

HABITAT: Dry slopes, ledges, rocky pine woods and the like. Usually grows in the mts. in scattered tufts, often under the protection of stiff or spiny bushes. Reported from the Tusayan N. F. as "common in Y. P. type, growing sparingly in warm, rocky, protected situations. Elevation, 6,500 to 7,500 feet."

FLOWERING PERIOD: May to Aug. July to Aug. on the Tusayan N. F.

SEED DISSEMINATION: July to Oct. Aug. and Sept. on the Tusayan N. F.

FORAGE VALUE: More data desired. On the Tusayan N. F. it is stated that this species "is believed to have little or no forage value." On the other hand (see N. Mex. Agr. Expt. Sta. Bull. 81) it is reported that, in the Mogollon Mt. region of N. Mex., the plant is "so palatable" it is "rarely allowed to seed on the open range."

***Stipa pringlei lemmoni* Vasey. See *S. lemmoni* (Vasey) Scribn.**

***Stipa richardsonii* Link, 1833**

Richardson's porcupine-grass

Not *S. richardsonii* Gray, 1856

RANGE: From Alb. through the Rocky Mts. to Colo.; also in the Black Hills of S. Dak.

DESCRIPTION: Stems tufted, erect, slender, 2 to 3 ft. high; sometimes from a short rootstock. Leaves stiff, long, narrow and involute, the basal blades 5 to 10 in. long. Panicle 2 1-2 to 5 in. long, loose and open, the branches commonly in pairs, very slender, brownish-colored and few-flowered. Spikelets brownish, about 1-3 to 1-2 in. long, exclusive of awns; glumes unequal in length, the lower about 1-3 in. long and purplish when young; lemma about 1-4 in. long, covered with sparse hairs, becoming brown to nearly black when mature; awn slender, roughish, bent about in the middle, the lower half spirally twisted, not feathery, 1-2 to 4-5 in. long.

HABITAT: On hillsides, dry plains, mountain meadows and wooded slopes. Between 3,300 and 8,300 ft. in Mont. (fid. Rydberg). Collected at 5,100 ft. on the

Lewis & Clark N. F., in a dry, sandy loam, occurring mainly on benches and s. slopes. Reported to occur on the Medicine Bow N. F. "usually on dry prairie or park areas up to 9,000 ft."

FLOWERING PERIOD: July and Aug. on the Medicine Bow N. F.

SEED DISSEMINATION: Mainly Aug. on the Lewis & Clark N. F. "Latter part of Aug." on the Medicine Bow N. F.

FORAGE VALUE: Reported from the Medicine Bow N. F. as "a valuable constituent of the forage of the drier grass lands."

***Stipa setigera* Presl**

Southwestern porcupine-grass

RANGE: Most common in the Southwest, from s. Cal. eastw. to w. Tex.; it also occurs sparingly in Oreg. and n. Cal.

DESCRIPTION: A bunchgrass, the stems usually rather pale-colored, 16 in. to 3 ft. high, beset with short, rough hairs. Leaf-blades long and narrow, flat or in-rolled. Panicle about 6 in. long, loose, the branches spreading, slender, some of the lower branches 1 to 2 in. long. Glumes narrow, purplish, 3-nerved, with long-tapering points, the 1st glume about 5-6 in. long, longer than the 2d glume. Lemma 1-3 in. long, sparsely hairy. Awn 2 or 3 in. long, twice-bent, spirally twisted and short-pubescent to the 2d bend; space between the 1st and 2d bends relatively short; last segment of awn slender and flexuous, about 1 1-4 to 1 3-4 in. long. Known also as Bear-grass.

HABITAT: Common in the Coast Range and foothills of the Sierra Nevada in Cal., on well-drained soils.

FLOWERING PERIOD: More data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: Regarded in many parts of s. Cal. as one of the most valuable native bunchgrasses. The awns are apt to be troublesome to sheep and the palatability is greatest in early spring.

***Stipa speciosa* Trin. & Rupr.**

Plumed porcupine-grass

RANGE: Originally known from Chile. In N. Am. it is found from centr. Cal., eastw. to s. Colo. and southw. into Mex. It is especially characteristic of the Colorado and Mojave deserts and the arid regions n. to Mono Lake.

DESCRIPTION: Stems erect, densely tufted, rather stout, 1 to 2 ft. high. Leaf-sheaths smooth, or the lower pubescent or even felt-like at the base, the throat densely short-hairy; leaf-blades mostly basal, elongated, very narrow and inrolled, the uppermost stem-leaf nearly equaling the panicle. Panicle erect, narrow, dense, 4 to 8 in. long, white or tawny, feathery from the plumed awns. Glumes smooth, 3-nerved, long-tapering pointed, papery, about 1-2 to 2-3 in. long. Lemma about 1-2 as long as glumes, narrow, densely short-pubescent, often crowned with a tuft of hairs; awn with one sharp bend, 1 1-2 to 1 3-4 in. long, having a feathery appearance due to the presence of dense hairs, 1-4 to 1-3 in. long on the lower 1-2 or 2-3 of the awn, the remaining portion of the awn rough. Known also as Chilean porcupine-grass and Desert feather-grass.

HABITAT: Arid regions.

FLOWERING PERIOD: More data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: When young this plant furnishes palatable forage for all classes of stock, but towards maturity it is too coarse for sheep. Cattle and horses relish it at all times.

***Stipa thurberiana* Piper**

Thurber's porcupine-grass

S. occidentalis Thurb., in Wilkes U. S. Explor. Exped. 17: 483. 1874.Not *S. occidentalis* Thurb., in U. S. Geol. Explor. 40th Par. 5: 380. 1871.

RANGE: From Wash. to centr. Cal. and Nev.

DESCRIPTION: Stems tufted, slender, 6 to 18 in. high; leaf-sheaths smooth or roughish; leaf-blades mainly basal, rough, narrow and involute. Panicle 2 to 4 in. long, often subtended by an enlarged leaf-sheath. Spikelets usually somewhat purplish. Glumes 3-nerved, tapering-pointed, about 1-2 in. long. Lemma little more than 1-2 as long as the glumes, hairy, terminating in an obscurely twice-bent, often purplish awn, about 1 1-2 in. long, somewhat feathery to the 2d bend with short hairs.

HABITAT: In the mts., on well-drained soils.

FLOWERING PERIOD: More data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: Good for all classes of stock.

***Stipa tweedyi* Scribn.**

Tweedy's porcupine-grass

S. comata intermedia Scribn.

RANGE: From Alb. southw. in the Rocky Mts., through Idaho and Mont., to n. Ariz. and n. N. Mex.

DESCRIPTION: Stems densely tufted, smooth, often whitish-colored, erect, or spreading, 2 to 3 ft. high. Leaf-sheaths smooth, the lower ones generally whitish, ligule conspicuous; leaf-blades mainly basal and involute, the stem-blades 3 to 6 in. long, those of the sterile shoots longer and more slender. Base of panicle usually included in the topmost leaf-sheath, its branches naked below and solitary or in pairs. Glumes narrow, tapering, thin-tipped, about 1 in. long. Lemma hairy, especially at base, 1-2 to 3-5 in. long, exclusive of awn; awn twice-bent, often 4 in. long, roughish throughout, straight or slightly wavy beyond the 2d bend, not feathery. Resembles Needle-and-thread (*S. comata*) but the lemmas are much longer and the awns are shorter, thicker, and much straighter beyond the 2d bend. Appears also in the books under the names of Tweedy's stipa and Tweedy's needle-grass.

HABITAT: On plains and parks, in sandy to gravelly soil, dry hillsides, along railroad tracks, on rocky mt. slopes, and the like. Very drought-resistant and rather widely distributed. Collected at 7,000 ft. on the Tusayan N. F. Collected at 6,100 ft. on the Targhee N. F., where it is "very common in sage types in a well-drained soil." Occurs between 5,000 and 10,000 ft. in Colo., and between 6,700 and 8,300 ft. in Mont., fid. Rydberg.

FLOWERING PERIOD: June and July.

SEED DISSEMINATION: July and Aug.

FORAGE VALUE: Not highly palatable on account of coarse texture, but is grazed when young by cattle and horses, and again in the fall by all live stock, at which time it furnishes considerable dry feed. It grows in very dry places where little other vegetation occurs, so has often considerable importance on the range.

***Stipa vaseyi* Scribn.**

Sleepy grass

S. viridula robusta Vasey

RANGE: Still imperfectly known. Typically a Southwestern grass, from w. Tex. and s. Colo., through Ariz. and N. Mex. into n. Mex., including Lower Cal. Apparently only one specimen from Cal. is known. Reported also from Idaho. The southwestern equivalent of the smaller northwestern *S. viridula*.

DESCRIPTION: Stems stout and erect, 3 to 6 1-2 ft high, powdery-haired below the nodes, bright green in color. Leaf-sheaths usually fringed at the throat with numerous, white hairs and often sparsely hairy on the margins; leaf-blades flat or sometimes involute, elongated often being 18 in. or more long. Panicle stout, densely-flowered, erect-branched, often spike-like, 8 to 18 in. long. Glumes narrow, tapering, conspicuously 5 to 7-nerved, both about 2-5 in. long, firm, except papery in texture at tip, bristle-pointed, and rough to the touch on the back when stroked downwards. Lemma pubescent, 1-4 in. or more long, terminating in a twice-bent, roughish, not feathery-haired awn, about 1 to 1 1-2 in. long. Resembles Green porcupine-grass (*S. viridula*) in habit, but is a much larger plant. Known also as Vasey's stipa and Robust porcupine-grass.

HABITAT: In the mts., between about 5,000 and 9,000 feet.

FLOWERING PERIOD: More data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: One of the relatively few grass species reputed to be poisonous. Its alleged narcotic effect on horses has long been a matter of record and numerous cases of its toxic character are reported on the most creditable authority; scientific analyses, however, have so far failed to isolate any poisonous principle. Its effect on horses is said to resemble locoism in some particulars. " 'Sleepy grass' is quite abundant in the s. part of the e. Rocky Mt. region * * * the forage could hardly be very palatable in any event. However, in times of scarcity of pasturage it is quite closely grazed, in centr. Colo. at least, but whether with any ill effects has not been definitely ascertained. It is possible that the narcotic principle is not everywhere produced in injurious quantities." (T. A. Williams, in Div. Agros. Bull. 12:56. 1898). Dr. Pammel (Man. Pois. Plants, II: 357) states that the distinguished botanical explorer, Dr. E. Palmer, who discovered the species in Coahuila, Mex., "observed that it was poisonous to cattle, horses and sheep, causing them temporary sleepiness." For a more detailed account of this grass as forage see N. Mex. Agr. Expt. Sta. Bull. 81, pp. 58-60.

***Stipa viridula* Trin.**

Green porcupine-grass

RANGE: From s. Brit. Col., Alb. and Sask. southeastw., through e. Wash., Idaho, Mont., the Dakotas and w. Minn., to Utah, Colo. and Nebr. It does not occur in Cal. and is probably also absent from Oreg.

DESCRIPTION: Stems smooth, erect, rather stout, mostly 1 1-2 to 3 ft. high, occasionally taller. Leaf-sheaths usually hairy on the margins; leaf-blades mainly basal, inrolled, about 1-3 to 1-2 as long as the stems; blades of the stems broader and 3 to 9 in. long. Panicle 4 to 8 in. long, greenish, narrow and erect, somewhat spike-like, the branches appressed, mostly in pairs and rather densely flowered from near the base. Glumes equal, smooth, tapering, 1-4 to 1-3 in. long, with prominent green nerves. Lemma shorter than glumes, pubescent with silky hairs; awn usually twice-bent, twisted spirally to the 2d bend, roughish throughout, not feathery-haired, 3-4 to 1 1-4 in. long. Known also as Feather bunchgrass.

HABITAT: Common in meadowland up to about 8,300 ft. in Mont. (fid. Rydberg). Collected in a moist, loamy soil at 6,500 ft. on the Beartooth N. F. Found on the Medicine Bow N. F. "at lower altitudes on dry soil up to 9,000 ft." Collected at 3,550 ft. on the Payette N. F. in a loose, dry, gravelly loam. Collected on the Targhee N. F. at 6,200 ft., in a sandy soil in timber along an old road.

FLOWERING PERIOD: May to Aug. Reported to be latter part of July to middle of Aug. on the Medicine Bow N. F.

SEED DISSEMINATION: July to Sept. Reported to be Aug. on the Medicine Bow N. F.

FORAGE VALUE: Usually regarded as good; the leaf-blades remain green until late in the season and, consequently, it has a long period of usefulness. It is stated that the species is "not grazed very extensively" on the Beartooth N. F. On the Medicine Bow N. F. it is reported as "good forage, especially valuable as a constituent of hay."

Stipa viridula robusta Vasey. See *S. vaseyi* Scribn.

Stipa williamsii Scribn.

Williams' porcupine-grass

RANGE: Wash., Idaho, Mont., Wyo. and Utah.

DESCRIPTION: Stems slender to rather stout, erect from a sometimes bent base, 2 to 3 ft. high. Leaf-blades 6 to 12 in. long, narrow and flat, the sheaths shorter than the internodes and, at least the lower ones, softly pubescent. Panicle narrow, 5 to 9 in. long, the shorter branches spikelet-bearing to the base. Glumes nearly equal, with long-tapering, thin tips. Lemmas strongly appressed-hairy, 1-4 in. long, with a distinct "crown" of hairs at the apex; awn about 1 in. long, once or twice-bent, wavy, and roughish throughout.

HABITAT: Dry soils, open sagebrush slopes, rocky knolls and ridges. Occurs mostly between elevations of from about 6,000 to 8,000 feet.

FLOWERING PERIOD: Reported to be July on the Payette N. F.

SEED DISSEMINATION: Reported to be from about Aug. 1st on, Payette N. F.

FORAGE VALUE: Reported from the Payette N. F. to be "probably eaten by all stock, but so scattering as to be unimportant."

SYNTHERISMA

Syntherisma is a genus of annual, sometimes perennial, mostly weedy grasses, belonging to the *Paniceae*, Millet tribe of the Grass family. The stems are branching, the leaf-blades thin and flat. The somewhat lengthened, sessile or short-stalked, 1-flowered spikelets occur in pairs, or sometimes singly or in 3's, in 2 rows on one side of the angled or winged raceme-axis, the racemes finger-like, in whorls, or clustered at the summit. The first glume is sometimes wanting, the sterile lemma is 5-nerved, the papery or hardened fertile lemma has thin, transparent, but not inrolling margins.

About 20 species of *Syntherisma* are known, represented in all temperate and tropical regions, most of them natives of Europe and Asia. The species are called Finger-grasses or Crab-grasses.

Syntherisma sanguinalis (L.) Dulac.

Crab-grass

Digitaria sanguinalis (L.) Scop.

Panicum sanguinale L.

RANGE: A native of Europe and Asia, now widely naturalized as a weed in all cultivated regions. It is found practically throughout N. Am. except in the extreme north. Most common in the s. e. States.

DESCRIPTION: Variable, as would be expected from its immense range. From 1 to 3 ft. high (although heights of about 6 ft. are on record) from a decumbent or even creeping base. Often takes root at the bent, lower nodes. Stems usually roughish. Leaf-blades varying greatly in hairiness and smoothness, usually 2 to 5 in. long, the leaf-sheaths usually somewhat hairy. Spikelets in pairs, the pedicels sharply angled; first glume present but minute; second glume about 1-2 as long

as the grayish-colored fertile lemma. Known also as Pigeon-grass, Finger-grass, Crowfoot-grass and Red millet. The scientific name refers to the blood-red color often seen on the stems and spikelets.

HABITAT: In cultivated or waste places; reaches its best development on sandy soils.

FLOWERING PERIOD: May to Aug. (depending on locality).

SEED DISSEMINATION: July to Oct.

FORAGE VALUE: Usually regarded as a pest in the n. e. States; in the s. e. States, although one of the worst pests in cottonfields, it is often highly regarded as a forage and hay plant. It comes up quickly after harvest time in grainfields and makes excellent pasturage. It is stated that, in Tenn., "it is a fine pasture grass; although it has but few basal leaves and forms no turf, yet it sends out numerous stems or branches at the base and serves a most useful purpose in stock husbandry. It fills all the cornfields and many persons pull it out, which is a tedious process. It makes a sweet hay, and horses are exceedingly fond of it, leaving the best hay to eat it." In Bohemia this grass is cultivated very extensively as a grain for porridge.

Trichachne saccharatum (Buckl.) Nash. See *Valota saccharata* (Buckl.) Chase.

Tricuspis pulchella (H. B. K.) Torr. See *Tridens pulchellus* (H. B. K.) Hitchc.

Tricuspis stricta (Nutt.) Gray. See *Tridens strictus* (Nutt.) Nash.

TRIDENS

A member of *Festuceae*, the Fescue-Bluegrass-Brome tribe. There are about 25 species, mostly American. The genus *Tridens* is characterized as follows: Perennials; panicle open, contracted or sometimes spike-like; spikelets 3 to many-flowered, the florets perfect or the upper ones staminate; glumes keeled, usually shorter than the lemmas, sometimes longer; lemmas 3-nerved, the apex shortly 2-toothed or entire.

Tridens avenaceus (H. B. K.) Hitchc.

Oat-like tridens

Sieglingia avenacea (H. B. K.) Kuntze.

RANGE: From w. Tex. to s. Ariz. and s. into S. Am.

DESCRIPTION: Stems 8 to 12 in. high from a stoloniferous base. Leaves 2 to 3 in. long. Panicle egg-shaped, 1 to 2 in. long, dense; spikelets 1-4 to 1-3 in. long, 5 to 8-flowered; lemmas awned, prominently hairy, giving the entire panicle a woolly appearance.

HABITAT: Open, dry situations, on gravelly, rocky or barren hills. In s. Ariz. collected at an elevation of about 4,500 feet.

FLOWERING PERIOD: Aug. and Sept.

SEED DISSEMINATION: Sept. and Oct.

FORAGE VALUE: Occurs too scatteringly on N. F. ranges to have any forage value.

Tridens pulchellus (H. B. K.) Hitchc.

Low tridens

Dasyochloa pulchella (H. B. K.) Willd.

Sieglingia pulchella (H. B. K.) Kuntze

Tricuspis pulchella (H. B. K.) Torr.

Triodia pulchella H. B. K.

RANGE: From Wyo. to the Mojave and Colorado deserts of e. Cal., Tex. and s. into Mex.

DESCRIPTION: Stems low, tufted, slender, seldom over 6 in. high, consisting of 1 long internode. Leaves short, stiff, sharp-pointed, rough, in clusters at the top of the internode, these clusters frequently bending over to the ground, rooting and reproducing the plant vegetatively. Panicle shortened, usually not exceeding the leaf-blades; spikelets 1 to 5 in number, nearly sessile, 5 to 10-flowered; glumes about equal, broad, awn-pointed, 1-4 to 1-3 in. long and about as long as the spikelet; lemmas 1-6 in. long, conspicuously long hairy below, cleft about half way, the awn from between the two lobed apex about as long as the lobes.

HABITAT: Dry plains and foothills, usually rocky or barren soil.

FLOWERING PERIOD: Middle of July to middle of Sept.

SEED DISSEMINATION: Middle of Aug. to middle of Oct.

FORAGE VALUE: The leafage is dry, stiff and scanty and the plant, while abundant, is unpalatable and little grazed by stock.

Tridens strictus (Nutt.) Nash

Narrow tridens

Sieglingia stricta (Nutt.) Kuntze

Tricuspis stricta (Nutt.) Gray

Triodia stricta (Nutt.) Vasey

RANGE: From Mo. and Kans. to Miss. and Tex.

DESCRIPTION: Stems 1 1-2 to 4 ft. tall, erect. Leaves 6 in. to 1 ft. long or more, flat, long-pointed, smooth beneath, rough above. Panicle, spike-like 5 to 12 in. long, the branches appressed, the lower 1 to 2 in. long; spikelets 4 to 10-flowered, 1-6 to 1-4 in. long, the joints of the rachilla very short; glumes usually about 2-3 as long as the spikelet, rarely extending beyond the lemmas, smooth; lemmas slightly hairy on the lower half of the nerves.

HABITAT: Moist soil.

FLOWERING PERIOD: June to Sept.

SEED DISSEMINATION: July to Oct.

FORAGE VALUE: No data available.

Triodia pulchella H. B. K. See *Tridens pulchellus* (H. B. K.) Hitchc.

Triodia stricta (Nutt.) Vasey. See *Tridens strictus* (Nutt.) Nash.

TRIPLASIS

A member of *Festuceae*, the Fescue-Bluegrass-Brome tribe. There are 3 species, natives of the e. and s. parts of N. Am. They are characterized as follows: Perennials with small, nearly simple panicles; spikelets 3 to 6-flowered, florets far apart, the rachilla jointed between the florets; glumes keeled; lemmas rounded at the base, deeply 2-lobed at the apex, long awned between the lobes.

Triplasis purpurea (Walt.) Chapm.

Purple sand-grass

Sieglingia purpurea (Walt.) Kuntze

RANGE: Along the coast from Me. to Tex., along the shores of the Great Lakes and from Ill. to Nebr. and Tex.

DESCRIPTION: Stems tufted, widely spreading or ascending, wiry, 1 to 3 ft. high, nodes bearded. Leaves 1-2 to 2 1-2 in. long, 1-12 in. wide or less, rigid, rough. Terminal panicles 1 1-2 to 3 in. long, the few, stiff branches finally divergent; smaller panicles partly hidden in sheaths, produced at the nodes late in

the season; spikelets short pediceled, usually rose-purple, 1-5 to 1-3 in. long; awn of lemma scarcely exceeding the lobes.

HABITAT: In sand, especially on sea beaches.

FLOWERING PERIOD: June to Sept.

SEED DISSEMINATION: July to Oct.

FORAGE VALUE: Has value as a sand binder, but is very seldom observed to be grazed.

TRISETUM

Trisetum belongs to the *Aveneae*, the Oat tribe of the Grass family; its species number between 50 and 60 and occur in both the eastern and western hemispheres from the Arctic to the Temperate Zone and, in the high mountains, to the Tropics; other species occur in the cooler regions of the southern hemisphere. About 10 or 12 species are found in the U. S.

The species are tufted perennials (rarely annuals) with flat leaf-blades and narrow and spike-like or loose and open, terminal panicles. The spikelets are 2 (rarely 3 to 5) flowered, rather small, at least as compared with the *Avenas* or Oats, the rachilla jointed above the glumes, so that the glumes persist after the rest of the spikelet drops off, and prolonged behind the uppermost palea as a hairy or naked bristle. The florets are all perfect or the uppermost one may be staminate (male). The glumes are unequal in length, keeled, persistent and awnless, the 2d one usually about as long as the florets. The lemmas are usually shorter than the glumes, membranous in texture, keeled, cleft or 2-toothed at the apex, each bearing above the middle of the back a slender awn; the 2 teeth of the lemma are also, in many species, prolonged into slender awns, to which fact the scientific name alludes (*Trisetum*, from Latin *tri*, three, and *setum*, bristle); the dorsal awn on the lemma is usually bent and twisted. The palea is narrow and 2-toothed. The grain is smooth, inclosed in the lemma and palea, but not adherent to either.

Trisetums, as a whole, are palatable to all classes of stock but, with a few exceptions, are not abundant usually in any one place.

Trisetum brandegei Scribn.

Beardless trisetum

T. muticum (Boland.) Scribn.

T. subspicatum muticum Boland.

Graphephorum muticum (Boland.) Scribn.

RANGE: From s. Brit. Col. and s. Alb. to Cal. and Colo.

DESCRIPTION: Stems smooth, erect, 1 to 2 1-2 ft. high. Sheaths smooth or sparsely hairy, the hairs pointing downwards. Blades erect, 1-12 to 1-5 in. wide, rough or slightly hairy, elongated, often grayish-green. Panicle narrow, often spike-like, about 2 to 4 in. long, shining. Glumes about 1-4 in. long, rough on the keel, nearly equal in length, the 1st usually 1-nerved, the 2d glume 3-nerved. Lemmas slightly roughish, the lower one 1-6 in. long, awnless or the awn reduced to a minute bristle, the teeth sharp-pointed but not awn-like. Known also as Brandegee's trisetum. The species is interesting botanically, being near the border line between the *Festuceae* and *Aveneae*, Fescue and Oat tribes, respectively.

HABITAT: Mountain meadows. Collected at 5,000 ft. on the Wallowa N. F., "growing in considerable amount with *Panicularia elata*," although it is stated that it will grow in drier situations than the latter plant. In Colo. (fid. Rydberg) it occurs in wet meadows between about 9,000 and 10,500 feet.

FLOWERING PERIOD: June and July on the Wallowa N. F.

SEED DISSEMINATION: Aug. and Sept. on the Wallowa N. F.

FORAGE VALUE: Very palatable to sheep and horses.

Trisetum canescens Buckl.

Tall trisetum

RANGE: From Brit. Col. to Cal. and eastw. to w. Mont. and N. Mex. Reported also from Alaska.

DESCRIPTION: Stems erect or somewhat decumbent at base, 2 to 4 ft. high. Sheaths rather loose, pubescent, especially the lower ones. Blades rough, pubescent, 2 to 10 in. long. Panicle 4 to 8 in. long, narrow, varying from densely-flowered and spike-like to interrupted and somewhat loose. Spikelets 1-4 to 1-3 in. long. Glumes smooth, except on the keel, the 2d noticeably longer than the 1st and 3-nerved instead of 1-nerved. Lemmas firm, roughish, the upper one exceeding the glumes, the teeth awn-like; awns rough, bent, spreading, twisted below, usually about 1-2 in. long, attached 1-3 below the apex. Known also as Silvery oat-grass:

HABITAT: Mountain meadows, moist ravines, and along streams; also in dry open ground, open woods and thickets. Collected on the Shasta N. F. in a medium-moist volcanic ash, at 3,900 feet.

FLOWERING PERIOD: April to July. May and June on the Shasta N. F.

SEED DISSEMINATION: June to Sept. July and Aug. on the Shasta N. F.

FORAGE VALUE: Produces an abundance of leafage, which is best suited to cattle and horses, although palatable to sheep as well.

Trisetum cernuum Trin.

Nodding trisetum

RANGE: From Alaska to Mont. and n. Cal.

DESCRIPTION: Stems rather lax, 2 to 3 1-2 ft. high. Sheaths smooth; blades thin, lax, roughish, 1-4 to 1-2 in. broad, rather elongated. Panicle lax, open, loosely-flowered, somewhat nodding, 5 to 12 in. long, the branches slender, flexuous, usually in whorls, spikelet-bearing towards the ends, naked below. Spikelets 2 or 3 (rarely 4) flowered, 1-4 to 1-2 in. long, the florets rather distant. Glumes rough on the keel, conspicuously unequal, the 1st narrow, 1-nerved, and the 2d broad, 3-nerved, and about 1-6 in. long or 3 or 4 times as long as the 1st glume. Lemmas with bristle-like teeth, roughish, with a few hairs at base, the awn arising below the base of the cleft, bent, spreading, twisted below, 1-4 to 1-2 in. long. Called also Nodding oat-grass. The scientific name *cernuum* ("nodding") refers to the panicle.

HABITAT: Moist soils, often in woods. Collected on a meadow area, in lodgepole, at 5,000 ft. on the Wallowa N. F., associated with Western rye-grass (*Elymus glaucus*) Tufted hair-grass (*Deschampsia caespitosa*) Spiked redtop (*Agrostis exarata*) Small-flowered melic-grass (*Melica imperfecta*) two clovers (*Trifolium arcuatum* and *T. latifolium*) and California hellebore (*Veratrum californicum*), in which association it is reported to be one of the two most important grasses.

FLOWERING PERIOD: May to July. July on the Wallowa N. F.

SEED DISSEMINATION: July to Sept.

FORAGE VALUE: Reported from the Wallowa N. F. that, owing to the fact that it grows with clovers and other palatable weeds, sheep do not care very much for it until the close of the grazing season.

Trisetum melicoides (Michx.) Vasey

Northern trisetum

Graphephorum melicoideum (Michx.) Beauv.

RANGE: From Anticosti Island in the Gulf of the St. Lawrence River s. to N. B., Me. and Vt., and westw. to Mich. and the shores of the Great Lakes, and north-

westerly to the Northwest Territories; also collected on the Wallowa N. F. The w. range of this species is still imperfectly known.

DESCRIPTION: Stems slender, pale green, tufted, erect, 1 to 3 ft. high. Leaf-sheaths and leaf-blades roughish. Panicle shining, lax, nodding, 4 to 5 in. long. Spikelets 7-25 in. long. Lemmas somewhat roughish, bluntly 2-toothed at apex, each with a very short, straight, erect awn, 1-25 to 1-12 in. long. The scientific name refers to a resemblance of the species to certain species of *Melica*.

HABITAT: Pine woods, rocky or gravelly shores and banks, and other moist, well-drained, usually shaded sites.

FLOWERING PERIOD: June and July.

SEED DISSEMINATION: Aug. and Sept.

FORAGE VALUE: More data needed.

***Trisetum montanum* Vasey**

Rocky Mountain trisetum

RANGE: Idaho (and Mont.?) southw. through the Rocky Mts. to N. Mex.

DESCRIPTION: Stems slender, smooth, erect or somewhat bent at base, 8 in. to 2 1-2 ft. high. Lower leaf-sheaths pubescent; leaf-blades slightly rough, usually broadened at base into a pair of ear-like appendages, mostly narrow, those of the sterile shoots sometimes as much as 10 in. long; ligule rather conspicuous. Panicle roughly lance-shaped, many-flowered, somewhat contracted, 3 to 5 in. long, open but not spreading, the branches mostly in 3's to 5's. Spikelets 2-flowered, 1-5 to 1-4 in. long, the rachilla somewhat hairy. First glume 1-nerved, much shorter and narrower than the 2d glume. Lemmas about 1-5 in. long, with a few short hairs at base, overtopping the glumes, and terminating in 2 very fine, bristle-like teeth; lemma-awn spreading when dry, bent, 1-8 to 1-4 in. long.

HABITAT: In moist places in the mts., often among bushes. Between 7,500 and 10,000 ft. in Colo. (fid. Rydberg). Between 7,500 and 9,000 ft. in n. N. Mex. (fid. Wooton & Standley).

FLOWERING PERIOD: May to July.

SEED DISSEMINATION: July to Sept.

FORAGE VALUE: More data desired. According to Wooton & Standley (N. Mex. Agr. Expt. Sta. Bull. 81) the species is "of little importance, adding but a little to the crop of summer forage found in the timbered areas of the higher mountains."

***Trisetum muticum* (Boland.) Scribn.** See *T. brandegei* Scribn.

***Trisetum spicatum* (L.) Richter**

Spiked trisetum

T. subspicatum (L.) Beauv.

RANGE: Widely distributed in the cooler portions of the northern hemisphere. In N. Am. it occurs from Lab. to Alaska, s. to Conn., N. Y. and the Great Lakes and, in the Appalachians, to N. C. and Tenn., another arm extending southw. in the West through the Rocky Mts. to N. Mex. and to the Sierra Nevada in Cal.; also through Mex. on the highest peaks.

DESCRIPTION: Very variable, as would be expected from its enormous range. Stems, varying with ecological conditions, from 3 in. to 2 ft. high, slender or rather stout, erect, unbranched, varying from smooth and hairless to softly and densely pubescent. Sheaths usually shorter than the internodes, they and the blades typically covered with a fine down; blades 4-5 to 4 or 5 in. long, 1-25 to 1-6 in. wide. Panicle shining, pale or often dark-purple, 1 1-5 to 6 in. long, dense but often interrupted below, narrow and spike-like, the branches erect, up to 1 1-2 in.

long. Spikelets 2 to 3-flowered, 1-6 to 1-4 in. long. Glumes shining, smooth except for the rough keels, the 1st 1-nerved, narrower and shorter than the 3-nerved 2d glume. Lemmas narrow, roughish, the teeth produced into short awns, the lowest lemma overtopping the glumes; awn attached about 1-3 below the apex of lemma, spreading, bent and twisted, at least when dry, 1-6 to 1-4 in. long. Known also as Wool grass, Downy oat-grass and Narrow false oats.

HABITAT: In the mts. and on rocky banks. Frequent in moist places at the higher elevations. Occurs in Colo. between 10,000 and 13,000 ft. (fid. Rydberg). In Mex. it is found usually on volcanic peaks mostly above timberline. A characteristic alpine plant of the Sierra Nevada from timberline to snowline. Collected in an open situation, sandy loam soil, at 8,000 ft. on the Beartooth N. F. Collected at 7,200 ft. on the Lewis & Clark N. F., where it is stated to occur on "rocky mountain slopes at timberline." On the Bonneville N. F. collected in a gravelly loam at 9,500 ft., and, on the Medicine Bow N. F., "in moist soils up to 11,000 ft." Collected at 8,100 ft. on the Caribou N. F. in a rich soil, open weed and grass type, and is stated to be "fairly abundant at high altitudes." Collected at 6,250 ft. in a sandy-gravelly loam, open lodgepole, on the Targhee N. F., and said to be "common." Collected on the Kern N. F. in a damp to wet, rich, loamy sediment at 9,000 feet. On the Wallowa N. F. "typically subalpine, although it occurs commonly above timber line and is found to a limited extent on n. and e. slopes in the Canadian (lodgepole pine) Zone."

FLOWERING PERIOD: May to Aug. July and Aug., Medicine Bow N. F.; July, Caribou N. F.; about July 10 to Aug. 10, Wallowa N. F.

SEED DISSEMINATION: July to Sept. Latter part of Aug. to Sept., Medicine Bow N. F. On the Wallowa N. F.: "Not earlier than Aug. 25 and the seed are not usually all matured at the time inclement weather sets in."

REPRODUCTION: Seed-viability is rather low. Tests made on the Wallowa N. F. in 1907 and 1909 gave percentages of viability of 11 and 28, respectively.

FORAGE VALUE: While it does not usually occur in dense stands it furnishes more forage than is generally conceded, the leaf-blades being eaten in preference to those of many other grass species. It is especially relished by sheep. It begins growth early, withstands trampling well and the leaves remain green and palatable throughout the season. Termed "a resistive, abundant species, affording excellent forage" on the Medicine Bow N. F. On the Caribou N. F. reported as "a fair forage grass for any class of stock." Reported to be "grazed by all classes of stock" on the Beartooth N. F., and, as "good forage," on the Bonneville N. F. On the Kern N. F. it is pronounced the "very best; preferred by stock to other species."

***Trisetum subspicatum* (L.) Beauv. See *T. spicatum* (L.) Richter.**

***Trisetum subspicatum muticum* Boland. See *T. brandegei* Scribn.**

***Trisetum wolfii* Vasey**

Wolf's trisetum

Graphephorum wolfii Vasey

RANGE: From Idaho and Mont. to Utah and Colo.

DESCRIPTION: Stems slender, erect from a somewhat bent base, 1 to 2 ft. high. Leaves roughish, 4 to 8 in. long, or the upper blades somewhat shorter. Panicle erect, close, almost spike-like, shiny, greenish or purplish, 2 1-2 to 6 in. long. Spikelets 2 or 3-flowered. Glumes nearly equal, the 1st 1-nerved, the 2d 3-nerved,

about 1-4 in. long. Lemma faintly 5-nerved, nearly as long as glumes, bearing a very small awn just below the apex.

HABITAT: Collected between 6,000 and 6,400 ft. on the Deerlodge N. F., in a sandy, black loam; reported to be "a moisture-loving plant, found among the willows and in moist meadow areas. Widely but not abundantly distributed." Found in wet meadows in Mont. (fid. Rydberg) between 3,300 and 8,300 feet. Reported by Holzinger to be "frequent in meadows," head of Little Potlatch River, Latah Co., Idaho.

FLOWERING PERIOD: Reported to be July and Aug., Deerlodge N. F.

SEED DISSEMINATION: Reported to be late Aug. to Sept., on the Deerlodge N. F.

FORAGE VALUE: Reported from the Deerlodge N. F. to be "palatable to horses, cattle and sheep; essentially a cow and horse feed; a valuable plant, due to the large amount of foliage produced; more palatable when found in full sunlight."

TRITICUM

A member of *Hordeae*, the Barley-Wheat tribe. The genus includes about 15 species. They are annual grasses with terminal spikes; spikelets 2 to 5-flowered, placed flat-wise and singly on opposite sides of a zigzag rachis.

Triticum aestivum L. See *T. vulgare* Vill.

Triticum caninum gmelini Griseb. See *Agropyron gmelini* (Griseb.) Scribn. & Smith.

Triticum repens subvillosum Hook. See *Agropyron subvillosum* (Hook.) E. Nels.

Triticum sativum Lam. See *T. vulgare* Vill.

Triticum vulgare Vill.

Wheat

T. aestivum L.

T. aestivum L.

RANGE: A native of s. Europe. Now cultivated in many parts of the U. S.

DESCRIPTION: Too well known to need description. There are many varieties grown in this country, some with awns, others awnless, some with glumes smooth, others with glumes pubescent.

FORAGE VALUE: Cultivated extensively for the grain, the grain being the most nutritious of all the cereals. When green the forage is palatable but after it has ripened the straw is unpalatable.

VALOTA

Valota is a small genus, belonging to the *Panicaceae*, Millet tribe of the Grass family. The species are perennials, with usually tufted stems, flat leaf-blades and narrow, usually densely hairy panicles, the slender, raceme-like branches of the panicle erect or nearly so. The spikelets are lance-shaped, in pairs, short-pediceled in 2 rows along one side of a narrow rachis. The 1st glume is smooth and minute; the 2d glume and the sterile lemma are usually as long as the fruit or longer, 3 to 5-nerved, typically clothed with copious, long, silky hairs (in one species, only, the silky hairs are not long and dense). Fruit not open at apex, lance-shaped, usually brown, with broad, flat, white, and thin margins. Grain lens-shaped in section.

Valota saccharata (Buckl.) Chase

Arizona cotton-grass

Panicum saccharatum Buckl.

Panicum lachnanthum Torr.

Trichachne saccharatum (Buckl.) Nash

RANGE: From w. Tex., through N. Mex. and Ariz. and southw. to centr. Mex.

DESCRIPTION: Stems erect and slender, 20 to 40 in. high, from strong, woolly, knotted rootstocks. Leaf-blades 4 to 10 in. long. Panicle narrow, almost spike-like, 4 to 6 in. long, with short, erect branches. Spikelets clothed with silky hairs much exceeding the spikelet, the pubescence white or nearly so or sometimes purplish. Known also as Cotton-top grass, Silky panic-grass, Sugar-grass and Small feather-grass.

HABITAT: Dry plains, rocky hills, edges of fields, limestone slopes. Often common on the plains and foothills of the drier mts. of the Southwest.

FLOWERING PERIOD: More data needed.

SEED DISSEMINATION: More data needed.

FORAGE VALUE: More data desired. Attempts to cultivate the species have been made by the Univ. Ariz. Agr. Expt. Sta. Reported as "fair forage" from the Apache N. F.

GLOSSARY

- Appressed*, lying close and flat against, said especially of pubescence or the branches of a panicle.
- Articulated*, jointed; having a node or joint.
- Ascending*, rising somewhat obliquely, or curving upward.
- Awn*, a bristle-like appendage on the floral bracts of grasses; the "beards" of wheat, rye, etc., are awns.
- Awned*, provided with awns; bearded.
- Axil*, the upper angle at the junction of a branch with the main stem, especially of a leaf or leaf-stalk with the plant stem.
- Axillary*, occurring in an axil.
- Compound*, composed of separate, but similar parts, as a *compound panicle*.
- Convolute*, literally, "rolled together," rolled up lengthwise, either with one edge rolled inside as a sheet of paper is ordinarily rolled, or both edges rolled toward each other, forming a sort of tube, as in many grass leaves.
- Decumbent*, reclining on the ground, as a stem, but with the summit tending to rise. *Decumbent* conveys the idea of weakness.
- Diffuse*, widely or loosely and irregularly spreading.
- Dorsal*, upon or relating to the back or outer surface of an organ.
- Exserted*, thrust out of or protruding from, as stamens exserted from a flower or a panicle exserted from a leaf-sheath.
- Flexuous*, bending gently in opposite directions; slightly zigzag or wavy.
- Floret*, a diminutive flower, especially the readily detachable flowers of a grass spikelet, consisting of the lemma and its attendant palea, together with the essential floral organs, the stamens and pistils.
- Glumes*, the two lowest, opposite chaffy bracts of a grass spikelet, which are empty, i. e., do not bear stamens or pistils in their axils. The lower one is known as the 1st glume and the upper one, as the 2d glume.
- Imperfect*, one-sexed, male or female, wanting either stamens or pistils.
- Inflorescence*, the flowering part of a plant, and especially the mode of its arrangement.
- Internodes*, the portions of a stem between the nodes or "joints."
- Interrupted*, not continuous; not uniform, for example, in density, as an *interrupted* spike, i. e., a spike which has the spikelets in some place or places smaller or fewer in number than elsewhere.
- Involucre*, a whorl or circle or set of bracts around and beneath a flower, as the involucre of glumes at the base of the multiple spikelets of *Elymus*.
- Involute*, with both edges rolled in toward the middle, as in a leaf, each edge presenting a spiral appearance in cross section.

Keel, a projecting ridge on a surface, like the keel of a boat, as the keel of a glume.

Keeled, provided with a keel or keels.

Lemmas, the so-called "flowering glumes" of grasses, the chaffy bracts, which, together with the paleas, enclose the stamens and pistils or essential floral organs. A 1-flowered grass spikelet has, of course, one *lemma* only, a 2-flowered spikelet has two *lemmas*, and so on.

Ligule, the projecting, usually tongue-like, membranous end of the lining of the leaf-sheath, seen at the base of the leaf-blade, between it and the stalk; a very characteristic feature of the Grass family. The ligule is quite constant in a given species and it is often an important means of distinguishing grasses; sometimes it is reduced to a mere fringe of hairs or to a hardened ring.

Linear, "line-like," narrow and flat, with the margins parallel, as the leaf-blades of many grasses.

Nerve, a name for ribs or veins, when unbranched and approximately parallel, applied especially in the case of leaves and the chaffy bracts (glumes, lemmas and paleas) of grass flowers.

Nerved, provided with *nerves*, as a 1-nerved glume.

Nodes, the so-called "joints" of stems from which leaves arise; they are enlarged and often dark-colored.

Palea, the chaffy bract opposite the lemma and, with it, enclosing the stamens and pistils and, later, the grain; in some books called the *palet*.

Panicle, a compound raceme; a form of compound inflorescence in which the lower branches are typically longer and blossom earlier than the upper branches.

Pectinate, comb-like, arranged or divided like the teeth of a comb.

Pedicel, the foot-stalk or stem of an individual flower in a cluster, or of a spikelet in a grass cluster.

Persistent, remaining attached, instead of falling away, at the time such parts ordinarily drop off; said of leaves or of the parts of a grass spikelet; as the glumes of brome-grasses *persist*, or are *persistent*, after the florets drop off.

Pistillate, female, bearing pistils or seed-producing organs only.

Plumose, feathery, having fine hairs on each side, like the plume of a feather.

Pubescent, downy-haired, covered with *pubescence* or fine and soft hairs.

Raceme, a flower-cluster composed of one-flowered pedicels, the lower flowers on longer pedicels and blossoming earlier than the upper flowers.

Rachilla, the axis of a spikelet, the prolongation of the pedicel.

Rachis, the axis of a spike, raceme or branch of a panicle.

Rhizome, a rootstock. In its simplest form, merely a creeping, usually thickened stem or branch growing partly or entirely beneath the surface of the ground. That a rhizome is really a stem and not a root is evident from its manner of growth, from its consisting of a succession of joints, and from the scales, which are true though degenerated leaves, that are borne at these joints and which often have buds in their axils.

Rootstock, a root-like stem or branch on or under ground; a rhizome.

Runner, a long, slender, tendril-like, leafless form of creeping branch, prostrate on the ground. Each runner, after having grown to its full length, strikes root from the tip (it sometimes roots at the joints also, in which case it may merge into a stolon, fixing the tip to the ground, then forms a bud at that point, which later develops into a tuft of leaves and so gives rise to a new plant).

Sessile, literally "sitting," i. e., without a stem or stalk; a *sessile* spikelet is stalkless, "sitting" directly on the axis of the inflorescence.

Simple, unbranched, as are the stems of many grasses.

Spike, an elongated flower-cluster in which the flowers or spikelets are sessile. A raceme in which the pedicels are reduced to nothing becomes a spike.

Spikelet, a name applied to each of the main components of a grass flower-cluster. A spikelet usually consists of two glumes and one or more florets; it may be erect or pendulous, sessile or pedicellate.

Staminate, male, bearing stamens or pollen-producing organs only.

Sterile, barren; said of shoots that produce leaves but no flowers, of anthers (pollen sacs) that are rudimentary and do not function, etc.; also synonymous with *imperfect*.

Stolon, a trailing or reclining branch, above ground, which strikes root where it touches the soil, there sending up new shoots which, later, become separate plants. Many plants multiply vegetatively in this way.

Stoloniferous, bearing stolons.

Strict, narrow and erect; said, for example, of grass panicles, the branches of which are erect and closely appressed to the main axis of the inflorescence, giving a spike-like appearance.

LIST OF ABBREVIATIONS

Agr.—Agriculture, agricultural.

Ala.—Alabama.

Alb.—Alberta.

Apr.—April.

Ariz.—Arizona.

Ark.—Arkansas.

Aug.—August.

B. P. I.—Bureau of Plant Industry.

Brit. Col.—British Columbia.

Bull.—Bulletin.

Cal.—California.

Can.—Canada.

centr.—central.

Centr. Am.—Central America.

Co., Cos.—County, Counties.

Colo.—Colorado.

Conn.—Connecticut.

D. C.—District of Columbia.

Dec.—December.

Del.—Delaware.

Dept.—Department.

Div. Agros.—Division of Agrostology.

e.—east or eastern.

eastw.—eastward.

Expt. Sta.—Experiment Station.

Feb.—February.

Fla.—Florida.

ft.—foot or feet.

Ga.—Georgia.

Greenl.—Greenland.

Ill.—Illinois.

in.—inch or inches.

Ind.—Indiana.

Jan.—January

Kans.—Kansas.

Ky.—Kentucky.

La.—Louisiana.

Lab.—Labrador.

Man.—Manitoba.

Mar.—March.

Mass.—Massachusetts.

Md.—Maryland.

Me.—Maine.

Mex.—Mexico.

Mich.—Michigan.

Minn.—Minnesota.

Miss.—Mississippi.

Mo.—Missouri.

Mont.—Montana.

mt., mts.—mountain, mountains.

n.—north, northern.

N. Am.—North America.

Nat.—National.

N. B.—New Brunswick.

N. C.—North Carolina.

N. Dak.—North Dakota.

N. E.—New England.

n. e.—northeast, northeastern.

Nebr.—Nebraska.

Nev.—Nevada.

N. F.—National Forest.

Nfd.—Newfoundland.

N. H.—New Hampshire.

N. J.—New Jersey.

N. Mex.—New Mexico.

Nov.—November.

N. S.—Nova Scotia.

N Y.—New York.

Oct.—October.

Okla.—Oklahoma.

Ont.—Ontario.

Oreg.—Oregon.

p., pp.—page, pages.

Pa.—Pennsylvania.

Que.—Quebec.

R. I.—Rhode Island.

s.—south, southern.

S. Am.—South America.

Sask.—Saskatchewan.

S. C.—South Carolina.

S. Dak.—South Dakota.

s. e.—southeast, southeastern.

Sept.—September.

southw.—southward.

sp., spp.—species.

s. w.—southwest, southwestern.

Tenn.—Tennessee.

Tex.—Texas.

U.S.F.S.—United States Forest Service.

Va.—Virginia.

Vt.—Vermont.

w.—west or western.

Wash.—Washington.

westw.—westward.

Wis.—Wisconsin.

W. Va.—West Virginia

Wyo.—Wyoming.

Y. P.—Yellow Pine.

INDEX TO DISTRIBUTION ON NATIONAL FORESTS

Names of National Forests are abbreviated as follows:

District 1 (D1).

1A	Absaroka	1J	Jefferson
1Bear	Beartooth	1Kan	Kaniksu
1Beav	Beaverhead	1Koo	Kootenai
1Bit	Bitterroot	1Lew	Lewis & Clark
1Bla	Blackfeet	1Lol	Lolo
1Cab	Cabinet	1Mad	Madison
1Cle	Clearwater	1Mis	Missoula
1Coe	Coeur d'Alene	1N	Nezperce
1Cus	Custer	1Pen	Pend Oreille
1Dak	Dakota	1Pri	Priest River Expt. Sta.
1Dee	Deerlodge	1Sel	Selway
1F	Flathead	1Sio	Sioux
1G	Gallatin	1StJ	St. Joe
1H	Helena		

District 2 (D2).

2A	Arapaho	2Mic	Michigan
2Bat	Battlement	2Min	Minnesota
2Big	Bighorn	2Mon	Montezuma
2BH	Black Hills	2N	Nebraska
2Bon	Bonneville	2P	Pike
2Bri	Bridger	2RG	Rio Grande
2Coc	Cochetopa	2Rou	Routt
2Col	Colorado	2SanI	San Isabel
2D	Durango	2SanJ	San Juan
2G	Gunnison	2Sho	Shoshone
2Har	Harney	2Sop	Sopris
2Hay	Hayden	2Sun	Sundance
2HC	Holy Cross	2Sup	Superior
2K	Kansas	2U	Uncompahgre
2L	Leadville	2Was	Washakie
2Mar	Marquette	2WR	White River
2Med	Medicine Bow		

District 3 (D3).

3Ala	Alamo	3L	Lincoln
3Apa	Apache	3M	Manzano
3Car	Carson	3Pec	Pecos
3Chi	Chiricahua	3Pre	Prescott
3Coc	Coconino	3S	Sitgreaves
3Cor	Coronado	3Ton	Tonto
3Cro	Crook	3Tus	Tusayan
3D	Datil	3W	Wichita
3G	Gila	3Z	Zuni
3J	Jemez		

District 4 (D4).

4A	Ashley	4Nev	Nevada
4B	Boise	4Pal	Palisade
4Cac	Cache	4Pay	Payette
4Car	Caribou	4Poc	Pocatello
4Cha	Challis	4Pow	Powell
4D	Dixie	4R	Ruby
4Fil	Fillmore	4Sal	Salmon
4Fis	Fishlake	4SR	Santa Rosa
4H	Humboldt	4Saw	Sawtooth
4I	Idaho	4Sev	Sevier
4K	Kaibab	4Tar	Targhee
4LS	La Sal	4Tet	Teton
4Lem	Lemhi	4Toi	Toiyabe
4Man	Manti	4U	Uinta
4Min	Minidoka	4Was	Wasatch
4Moa	Moapa	4Wei	Weiser
4Neb	Nebo	4Wyo	Wyoming

District 5 (D5).

5A	Angeles	5Mry	Monterey
5Cal	California	5P	Plumas
5Cle	Cleveland	5SB	Santa Barbara
5E	Eldorado	5Seq	Sequoia
5I	Inyo	5Sha	Shasta
5Ker	Kern	5Sie	Sierra
5Kla	Klamath	5Sta	Stanislaus
5L	Lassen	5Tah	Tahoe
5Mod	Modoc	5Tri	Trinity
5Mno	Mono		

District 6 (D6).

6Cas	Cascade	6P	Paulina
6Che	Chelan	6R	Rainier
6Chu	Chugach	6San	Santiam
6Colu	Columbia	6Sis	Siskiyou
6Colv	Colville	6Siu	Siuslaw
6Cra	Crater	6Sno	Snoqualmie
6D	Deschutes	6T	Tongass
6F	Fremont	6Uma	Umatilla
6Mal	Malheur	6Ump	Umpqua
6Min	Minam	6Wal	Wallowa
6Och	Ochoco	6Was	Washington
6Oka	Okanogan	6Wenah	Wenaha
6Oly	Olympic	6Wenat	Wenatchee
6Ore	Oregon	6Whi	Whitman

A

Achyrodes aureum

D5

Agropyron albicans

1Bear

Agropyron caninum

1Dee

2Big 2BH 2Coc 2G 2Har 2Sun

4Cac 4D 4Man 4Saw 4U

5Mod

6Colv 6Sis 6Wenah

Agropyron dasystachyum

4Tar

Agropyron flexuosum

4Saw

5Mno

6F 6Wal

Agropyron gmelini

2Bon 2Col 2Med

4Tar

6Wenah

Agropyron lanceolatum

4Fis

6Och

Agropyron palmeri

3J

Agropyron pringlei

3Apa

5Kla

Agropyron pseudorepens

1Dee

2A 2Bon 2Med 2RG 2Was

3Tus

4Sev

6Och

Agropyron repens

6Cra 6Och

D7

Agropyron richardsoni

1Lew

2Big

Agropyron riparium

6Wal

Agropyron scribneri

2Bon

4Man

Agropyron smithii

1Cus 1Dee 1Lew 1Sio

2Coc 2Hay 2HC 2Mon 2N 2SanJ 2Sun 2U

3Coc 3D 3S 3Tus 3Z

4Fis 4LS 4Sev

D7

Agropyron smithii molle

1Lew

2Bon 2HC 2Sho

Agropyron spicatum

1Bear 1Cle 1Dee 1H 1Lew 1Mis

2Hay 2Med 2Was

4Fil 4Saw 4Tar 4Wei

6Colv 6F 6Och 6Uma 6Wal 6Wenah

6Whi

Agropyron spicatum inerme

6Colv

Agropyron spicatum tenuispicum

4Saw

Agropyron subvillosum

1Bear 1Beav

2Big 2Col

4Fis 4Man 4Tar 4U

Agropyron tenerum

1A 1Bear 1Bla 1Dee 1H 1Lew 1Mad

2Big 2Bon 2Bri 2Col 2G 2Hay 2HC 2L

2Med 2N 2Rou 2SanJ 2Sho 2Sun 2U

2WR

3Coc 3D 3Pec 3Tus

4Cac 4Car 4Man 4Min 4Pay 4Saw 4Tar

4Tet 4U 4Wei

5E 5Sha 5Sie 5Tah

6F 6Wal

Agropyron vaseyi

4Man 4Nev

5Mod

Agropyron violaceum

1Dee

2Col 2Med 2Mon 2RG 2Sop 2U

3Coc

4Sev

6Wal

Agrostis aequalvis

6Wal

Agrostis alba

1Lew

2Bon 2Coc 2Col 2G 2Rou 2Sun

3Ala 3Car 3D 3Tus

4Cac 4H 4LS 4Man 4Min 4Tar 4U

5L 5Mno 5Sha 5Tah 5Tri

6Och 6Wal 6Whi

Agrostis alba vulgaris

4Man

Agrostis ampla

5Tri

Agrostis exarata

1Dee 1H 1Lew

2Bri 2Hay 2HC 2Rou

3Tus

4Cac 4Min 4Pay 4Saw

5E 5Mno 5Sha 5Sie 5Tah

6F 6Och 6Ore 6San 6Sis 6Wal

Agrostis foliosa

1Dee

5Kla

6Sis 6Wal

Agrostis hallii

5Tri

Agrostis hiemalis

1Bear 1Bla 1Dee 1H 1Lew 1Mad 1Pri

1StJ

2Big 2BH 2Bon 2Coc 2Col 2G 2Har

2Hay 2HC 2L 2Med 2Mon 2N 2Rou

2SanI 2SanJ 2Sun 2U 2WR

3Apa 3Car 3Coc 3Pec 3Tus

4Car 4Fis 4LS 4Min 4Pal 4Pay 4R 4Saw

4Tar 4Tet

5E 5I 5Seq 5Sha 5Sie 5Tah

6Colv 6D 6Ore 6R 6Uma 6Ump 6Wal

6Wenah

Agrostis hiemalis geminata

1Sel

2Med

3Apa

5E

6Och

Agrostis idahoensis

1A 1Cle

2G 2Med

4Pay 4Sev

Agrostis microphylla

5Kla

Agrostis oregonensis

1Cle

Agrostis pallens

6Och

- Agrostis rossae*
 1Dee 1Sel
 4Pay
 5I 5Sie 5Tri
 6Min 6Sis 6Wal
Agrostis schiedeana
 5Sie
 6F
Agrostis stolonifera
 5I
Agrostis thurberiana
 1Cle
 5E 5Sie
 6Wal
Aira caryophylla
 5Kla 5Tri
Alopecurus aristulatus
 1Dee
 2G 2N 2Sun
 3Tus
 4D 4Fis 4Pay 4Tet
 5I
 6Och
Alopecurus californicus
 5Mod
Alopecurus geniculatus
 1Dee 1H 1Lew
 3Tus
 D5
Alopecurus occidentalis
 1H
 2P
 4Tar
Ammophila arenaria
 6Siu 6Ump
Andropogon chrysocomus
 3J
Andropogon furcatus
 1Sio
 2Mic 2N 2SanJ 2Sun
Andropogon hallii
 2K
 3Coc
Andropogon laguroides
 2K
 3Chi 3Coc 3Cor
Andropogon scoparius
 1Sio
 2K 2Mic 2Sun
 3Coc 3J 3M
Anthoxanthum odoratum
 5Kla
Aristida arizonica
 3Ala 3Cor 3G 3M 3Tus 3Z
Aristida bromoides
 3Apa 3Chi 3Cor 3G
Aristida divaricata
 3Cor 3Ton
Aristida fasciculata
 3Coc
Aristida fendleriana
 3Apa 3Coc 3Tus
Aristida havardii
 3G
Aristida longiseta
 2K
 3Coc 3J
 6Wal
Aristida oligantha
 3Coc
Aristida palmeri
 3S 3Tus
Aristida reverchonii
 3Apa 3Ton
Aristida scabra
 3Chi
Aristida schiedeana
 3Cor 3G
Avena americana
 1Bear
Avena barbata
 5Tri
Avena fatua
 5SB 5Seq 5Tri
Avena fatua glabrata
 6Cra
Avena mortoniana
 1Lew
 2P 2WR
Avena sativa
 2Sho
- B
- Beckmannia erucaciformis*
 1Lew
 2Coc 2Sho
 4Tar 4Tet
 5Mod
 6Mal
Blepharoneuron tricholepis
 2Coc 2SanJ
 3Car 3Coc 3G 3M 3Pec 3Z
 4Man
Bouteloua aristidoides
 3Apa 3Cor
Bouteloua barbata
 3Ala
Bouteloua curtipendula
 2BH 2K 2SanJ
 3Ala 3Chi 3Coc 3G 3Tus
Bouteloua eriopoda
 3Cor 3M 3Tus
Bouteloua filiformis
 3Cor 3Ton
Bouteloua gracilis
 1Cus 1Dee 1Lew 1Sio
 2BH 2Coc 2D 2Har 2L 2Mon 2N 2SanI
 2SanJ
 3Ala 3Car 3Coc 3D 3G 3J 3M 3Pec 3Pre
 3S 3Tus 3Z
 4Man 4Sev
Bouteloua hirsuta
 2Col 2K 2Mon 2P
 3Car 3Chi 3Coc 3Cor 3G
 4Fis
Bouteloua procumbens
 3Apa 3Coc 3Tus
Bouteloua radicata
 3Apa
Bouteloua rothrockii
 3Apa 3Cor
Bouteloua trifida
 3Cor
Briza minor
 D5
Bromus arenarius
 5Seq 5Tri
Bromus brizaeformis
 1H
 2Coc 2Col 2N
 4Pay 4Saw
 5Mod
 6Colv 6F 6Och 6Wal 6Wenah
Bromus carinatus
 3Coc
 4LS 4Pal
 5E 5I 5Mno 5Seq 5Sie 5Tah
 6Colu 6San 6Wenah 6Whi

Bromus carinatus californicus
 3Coc
 5Mod 5Sha
Bromus carinatus hookerianus
 5Mod 5Mry 5Seq 5Tri
Bromus ciliatus
 1Lew
Bromus commutatus
 2Was
 5Tri
 6Cra
Bromus grandis
 5Tri
Bromus hordeaceus
 2U
 4Man
 5Cle 5Ker 5Kla 5Seq 5Sha 5Tri
 6F 6Och 6Sis 6Wal
Bromus hordeaceus leptostachys
 5Mod
 6F 6Ore
Bromus inermis
 1H 1Lew
 2Bon 2G 2N 2U 2WR
 4U
 6Och
Bromus marginatus
 1A 1Bear 1Dee 1H 1Lew 1Mad 1StJ 1Sel
 2Big 2BH 2Hay 2Sun
 4Car 4D 4Man 4Min 4Pay 4Saw 4Tar
 5Ker 5Seq 5Tah
 6D 6F 6Mal 6Och 6Ore 6R 6San 6Uma
 6Ump 6Wal 6Whi
Bromus marginatus seminudus
 4Pal
 5Mno 5Sha 5Tri
 6Wal 6Wenah 6Whi
Bromus orcuttianus
 5E 5Sha 5Tri
Bromus polyanthus
 1Bla 1Cle
 2Bri 2Col 2G 2Mon 2Rou 2U
 3Ala 3Coc 3D 3G 3M 3Z
 4Cac 4Fis 4Man 4R 4Tet 4U
Bromus porteri
 1A 1Bear 1Dee 1Lew 1Mis
 2Big 2Bon 2Bri 2D 2G 2Har 2HC 2L
 2Mon 2RG 2SanI 2Sun 2U
 3Chi 3D 3G 3J 3Tus
 4Car 4D 4Fis 4Lem 4Man 4Saw 4Sev
 4Tar
Bromus porteri frondosus
 3Coc 3G
Bromus porteri lanatipes
 1Bear
 2Sun
Bromus pumpellianus
 1Lew
 2BH 2Big 2Sun
 D7
Bromus purgans
 D7
Bromus richardsoni
 1A 1Dee 1H 1Mad
 2Col 2G 2Med 2Mon 2N 2P 2Rou 2SanJ
 2Sho 2U 2WR
 3Coc 3Pec 3Tus
 4D 4Pay 4U
 6Wal 6Wenah
Bromus richardsoni pallidus
 1Cle
 2D 2Hay 2Mon
 3Coc
 4Pay

Bromus rubens
 5Cle 5Ker 5Mry 5SB 5Seq 5Sie
Bromus secalinus
 6Cas 6Colv 6Wal
 D7
Bromus subvelutinus
 3Tus
 5Mno 5Seq
 6F
Bromus suksdorfii
 6Ore 6Wal
Bromus tectorum
 1H
 2N 2Was
 4Cac 4D 4Fil 4Man 4Saw 4U
 6Colv 6Wal
Bromus tectorum nudus
 2Was
 4Pay 4Saw
 5Kla 5Mod 5Sha
 6Och
Bromus trinii
 5Ker
Bromus unioloides
 5I
Bromus villosus
 5Cle 5Ker 5SB 5Seq
Bromus villosus gussonei
 5Tri
Bromus vulgaris
 5Sie
 6F 6Ore 6Wal 6Whi
Bulbilis dactyloides
 2N

C

Calamagrostis aleutica
 6Sis
Calamagrostis breweri
 5Ker 5Seq 5Sie
Calamagrostis californica
 5I
Calamagrostis canadensis
 1Cle 1H 1Lew 1Sel
 2Big 2Col 2Hay 2HO 2Mic 2Rou 2SanJ
 2Sop 2U
 4Lem 4Man 4Pal 4Pay 4Saw 4Tar 4Tet
 5I
 6Colu 6Min 6Ore 6Wal 6Whi
Calamagrostis canadensis acuminata
 1Bla
 2Med
Calamagrostis densa
 1Cle 1Sel
 5Cle 5Tri
Calamagrostis hyperborea
 1Beav 1Cle 1Lew
 2Bon 2Col
 4Man 4Pal 4Tar
 5Cle
Calamagrostis hyperborea americana
 1Bla
Calamagrostis inexpansa
 1H
 4Tet
Calamagrostis langsдорфii
 1Cle
 2G 2Med
Calamagrostis montanensis
 1Beav
 2Sho

Calamagrostis purpurascens

1Lew 1Sel 1StJ
2Big 2Col 2P
4Man
5Seq

Calamagrostis rubescens

1Cle 1Dee 1Pri
2Col
4Car 4Pay 4Saw 4Tar
6Colu 6Min 6Och 6R 6Wal 6Wenah 6Whi

Calamagrostis rubescens luxurians

2Hay

Calamagrostis scribneri

1Lew
2Bri 2Sho
4Pal 4Saw
6R

Calamovilfa longifolia

1Sio
2K 2N

Capriola dactylon

3Cor

Catabrosa aquatica

1Lew
2Bat 2N
4Man 4Nev 4Pay 4Tar

Cenchrus carolinianus

2K 2N

Chaetochloa composita

3Chi 3G

Chaetochloa glauca

3Ala
6Cra

Chaetochloa grisebachii

3Apa 3Chi

Chaetochloa italica

2Mon
3Apa 3G

Chaetochloa verticillata

3Chi

Chaetochloa viridis

2N
3Ala 3Coc 3Tus

Chloris elegans

3Chi 3Cor 3G

Cinna latifolia

1Cle
4Man 4Pay
6Ump 6Wal 6Whi

D*Dactylis glomerata*

4Car 4Man 4Pal 4Saw 4Tet
5Sha 5Tri
6Sis

Danthonia americana

2Sun
4Pay
5E 5Seq 5Sie
6Colv 6F 6Och 6Sis

Danthonia californica

4D 4Pal 4Tar
5Kla 5L 5Sie 5Tah
6Wal

Danthonia compressa

2BH

Danthonia intermedia

1A 1Dee 1Lew
2BH 2Med 2Mon 2Rou 2Sun 2Was
4Pay 4Saw 4Tar 4Tet
5Sha
6Min 6Sis 6Wal

Danthonia intermedia cusickii

1Dee 1H
2Hay

Danthonia parryi

2RG

Danthonia spicata

2Mic

Danthonia thermale

2Sun

Danthonia unispicata

5Mod
6Sis

Deschampsia atropurpurea

1Cle 1Sel
6Min 6Wal

Deschampsia atropurpurea latifolia

6Min

Deschampsia caespitosa

1Bear 1Cle 1Dee 1H 1Lew 1Mad 1StJ
2Bat 2Big 2Bon 2Bri 2Coc 2Col 2G 2Med
2Mon 2P 2RG 2Rou 2Sho 2U 2WR
3Apa 3Z
4Cac 4Car 4Fis 4Man 4Pal 4Pay 4Saw
4Sev 4Tar 4Tet
5I 5Mno 5Seq 5Sie 5Tah
6F 6Mal 6Min 6Och 6R 6San 6Uma
6Ump 6Wal 6Whi

Deschampsia curtifolia

2RG

Deschampsia danthonioides

4Tar 4Wei
5Mod 5Seq
6Min 6Uma 6Wal 6Whi

Deschampsia elongata

1Lew 1Pri
4Pay 4Saw 4U
5E 5Seq 5Sie 5Tah 5Tri
6Cra 6D 6Mal 6Min 6Och 6Ore 6R 6Sis
6Uma 6Ump 6Wal 6Wenah 6Whi

Deschampsia gracilis

4SR
5Tri
6F

Deschampsia holciformis

D5
6Wal

Distichlis spicata

D5
6F

E*Echinochloa crus-galli*

2K 2N
3Ala 3D 3Tus
5Tah

Echinochloa zelayensis

3Apa 3G
6Cra

Elymus ambiguus

2L

Elymus aristatus

6F

Elymus borealis

6Wal

Elymus canadensis

1Cus 1Lew
2N 2Sun
3Coc
5Seq

Elymus condensatus

1Bear 1H 1Mad
2Bon
4Car 4Pay
5Mno
6Mal

Elymus glaucus
 1Bla 1Cle 1Pri 1StJ
 2BH 2Bon 2G 2Hay 2HC 2Mon 2Sun
 3Ala
 4Cac 4Man 4Pay 4R 4Saw 4Tar 4Tet
 5Cle 5Kla 5Seq 5Sha 5Sie 5Tri
 6Colu 6Colv 6F 6Min 6Och 6San 6Sis
 6Wal 6Whi

Elymus innovatus
 2BH 2Sun

Elymus leckenbyi
 6Colu

Elymus robustus
 1H

Elymus saundersii
 2G

Elymus triticoides
 2Col
 3Coc
 4Man
 5Cal 5I

Epicampes ligulata
 3Chi 3Coc

Epicampes rigens
 3Chi 3Coc
 5Cle 5Ker

Eragrostis limbata
 3Coc

Eragrostis lugens
 3Chi 3Cor

Eragrostis megastachya
 3Ala 3Apa 3Chi 3Coc 3Cor
 5Mod
 6Wal

Eragrostis mexicana
 3Apa 3Coc 3D 3G 3Pre
 5I

Eragrostis neomexicana
 3Chi 3Cor

Eragrostis pectinacea
 2N
 3G

Eragrostis pilosa
 3Chi 3Coc 3G
 5Tah
 D7

Eragrostis secundiflora
 2K

F

Festuca altaica
 5Sha

Festuca arizonica
 2Coc 2RG
 3Apa 3Coc 3J 3Tus

Festuca brachyphylla
 2BH 2Big 2Col 2G 2Med
 4Man
 5I

Festuca bromoides
 5Seq
 6Wal

Festuca californica
 5Sha 5Tri
 6Wal

Festuca calligera
 2Big
 4Pay
 5Kla
 6F

Festuca confinis
 1Bear 1H
 2Bon 2Col 2Sho 2Was
 4Car 4Man 4Tar
 5I

Festuca confusa
 5Sie

Festuca elatior
 2L
 3Ala
 5Sha
 6Cra 6Wal

Festuca hallii
 1Lew

Festuca idahoensis
 1A 1Bear 1Bla 1Cle 1Dee 1H 1Mad
 1Mis 1Sel 1StJ
 2Big 2Bon 2G 2Hay 2L 2Med 2RG
 2SanI 2SanJ 2Sun
 4Car 4I 4Pay 4SR 4Sal 4Saw 4Wei
 5Mod 5Sha 5Tri
 6Colv 6D 6F 6Mal 6Och 6Oka 6P 6R
 6San 6Sis 6Uma 6Wal 6Whi

Festuca megalura
 5Cle 5Kla 5Seq 5Tri
 6Ore 6Sis

Festuca microstachys
 6Och

Festuca minutiflora
 2L

Festuca myuros
 5SB

Festuca occidentalis
 1Lew
 4Man 4Pay
 5Sha 5Tri
 6Cra 6Sis 6Wal

Festuca octoflora
 2K 2N
 6Colv

Festuca octoflora hirtella
 3Tus
 4D 4Man
 5Cle

Festuca ovina
 1Bear 1H 1Lew
 2Col 2Mic 2Was
 3Apa 3G 3Z
 4Fis 4Tar
 5Sie
 6Och

Festuca ovina capillata
 2Mic
 D7

Festuca pacifica
 5Sha 5Tri
 6F 6Och 6Wal

Festuca pseudovina
 2Hay 2WR
 3Coc
 4Fis 4Man 4Sev
 6Wal

Festuca reflexa
 6Min

Festuca rubra
 2Coc 2Mon
 D3
 4Fis
 5E
 6Och 6Siu 6Wal

Festuca rubra kitaibeliana
 2Big

Festuca rubra megastachys
 6Ore

Festuca subulata
 4Man
 5Tri
 6Sis

Festuca supina
 2Med 2P
 5Mno

Festuca thurberi

1H

2G 2HC 2Mon 2RG 2SanJ 2U

Festuca viridula

1Sel

4Fis

5Tri

6Min 6Och 6Ore 6R 6San 6Ump 6Wal

G

Gastridium lendigerum

5Seq

6Sis

H

Heteropogon contortus

3Apa 3Cor 3Ton

Hilaria cenchroides

3Apa 3Coc 3Tus

Holcus halepensis

3Coc

Hordeum boreale

2Hay

5Sie

6San 6Whi

Hordeum caespitosum

1Cus 1Dee

2Big 2Bon 2Col

6Cra

Hordeum gussoneanum

5Mod

6Cra 6F

Hordeum jubatum

1A 1Cus 1Dee 1H 1Lew 1Mad

2Big 2Bon 2Col 2G 2HC 2Med 2N 2P 2U

3Car 3Tus

4H 4Man 4Min 4Pay 4Tar 4Tet

5Mno

6Mal

Hordeum murinum

3G

5Cle 5Ker 5SB 5Seq

Hordeum nodosum

1A 1Dee 1Lew

2A 2Bat 2G 2Hay 2Med 2Mon 2N

2Sho 2Was 2WR

3Apa 3Coc 3Cor

4Cac 4D 4Fis 4Lem 4Man 4Min 4Pal

4Pay 4Saw 4Sev 4Tar 4Tet

5Mod 5Seq 5Sie 5Tah 5Tri

6F 6Och 6Ore 6Uma

Hordeum pammeli

D7

Hordeum pusillum

2Sun

3Tus

D7

Hystrix hystrix

D7

K

*Koeleria cristata*1A 1Bear 1Cus 1Dak 1Dee 1H 1Lew
1Mad 1Mis 1Sel 1Sio

2A 2Bat 2Big 2Bon 2Coc 2Col 2D 2G

2Har 2HC 2L 2Med 2Mic 2Mon 2N

2P 2RG 2SanI 2SanJ 2Sho 2Sun 2U

2Was 2WR

3Apa 3Coc 3G 3J 3M 3Pec 3Tus

4Fis 4LS 4Lem 4Man 4Pal 4Saw 4Tar

4Tet

5Ker 5Mod 5SB

6Colv 6F 6Mal 6Och 6Uma 6Wal 6Whi

D7

Koeleria cristata pubescens

6Uma

Korycarpus diandrus

D7

L

Leptochloa dubia

3Chi 3Cor

Leptochloa filiformis

3Coc

Leptochloa imbricata

3Apa

Lolium multiflorum

3Ala

5Kla

Lolium perenne

6Cra

Lolium temulentum

5A

Lycurus phleoides

3Ala 3Apa 3Chi 3Coc 3Cor 3D 3G 3J

3M 3S 3Tus 3Z

M

Melica aristata

5Seq

6Cra

Melica bella

2Bat 2Big 2G 2Sop

4Cac 4D 4Man 4Pay 4Saw 4Tar 4Tet

5Mod

6Min 6Och 6Wal 6Whi

Melica bulbosa

4Lem

5I 5Kla 5Seq 5Sha 5Sie

6Wal

Melica frutescens

5Tri

Melica fugax

6Och 6Wal

Melica geyeri

6Cra

Melica harfordii

5Seq

6Min 6Whi

Melica imperfecta

5Cle 5Ker 5Seq

6Wal

Melica porteri

3Tus

Melica spectabilis

1A 1Bear 1Dee 1Mad

2Bri 2HC 2U

4Car 4Pay 4Tar

6Min 6Wal

Melica striata

3Pec

Melica stricta

4Nev

5Ker 5Mno 5Tri

Melica subulata

1Sel

4Pay

6Sis 6Wal

Muhlenbergia acuminata

3G

Muhlenbergia arenicola

3Apa

Muhlenbergia capillaris

3Chi

Muhlenbergia comata
 2G
 4Fis
 5I
 6Sis
Muhlenbergia cuspidata
 1Lew
 3D 3J
Muhlenbergia depauperata
 3Apa
Muhlenbergia distichophylla
 3Apa 3Chi
Muhlenbergia filiculmis
 2P
Muhlenbergia filiformis
 1Dee
 3Coc
 4Pay
 5E 5Sha 5Sie
 6Min 6Och
Muhlenbergia gracilis
 2G 2P 2RG 2SanJ
 3Car 3Chi 3Coc (3Cor?) 3D 3G 3J
 3M 3Tus 3Z
 4Fis
Muhlenbergia gracillima
 3M 3S 3Tus
Muhlenbergia jonesii
 5E
Muhlenbergia microsperma
 D5
Muhlenbergia monticola
 3G
Muhlenbergia neomexicana
 3Apa
Muhlenbergia pauciflora
 3Ala 3Apa 3Tus
Muhlenbergia porteri
 3Ala 3Cor
Muhlenbergia racemosa
 2N 2Sun
 3Ala 3Car 3Coc
Muhlenbergia repens
 3Apa 3Chi
Muhlenbergia richardsonis
 2Med 2RG 2Sho
Muhlenbergia squarrosa
 2BH 2Bon 2WR
 3Car 3Coc 3J 3Tus
 4Man
 5I 5Seq
 6F
Muhlenbergia vaseyana
 3Tus
Muhlenbergia virescens
 3Apa 3Coc
Muhlenbergia wrightii
 2SanJ
 3Apa 3Car 3Coc 3Tus
Munroa squarrosa
 2K
 3Apa

N

Nazia aliena
 3Apa
Notholcus lanatus
 6Cra 6D 6Och 6Ump

O

Oryzopsis exigua
 1Cle
 2Med
 4Lem 4Pay

Oryzopsis fimbriata
 3Chi 3G
Oryzopsis hymenoides
 1Mad
 2G 2Mon 2RG 2SanI
 3Coc 3M
 4Fil 4Man 4Nev 4Sev 4Tar
 5I 5Ker

Oryzopsis kingii
 5I 5Mno 5Sie

Oryzopsis micrantha
 2SanI
 3Coc 3M 3Tus
 4D

Oryzopsis pungens
 2Mic

P

Panicularia americana

1Lew
 2Col 2G
 6Wal 6Whi

Panicularia borealis
 3Tus

Panicularia elata
 1Cle 1H 1Lew
 5E 5Seq 5Tri
 6Och 6R 6Sis 6Wal 6Wenah

Panicularia erecta
 5Tah

Panicularia nervata

1H 1Mad
 2BH 2Bon 2Col 2HC 2Med 2Mon 2N
 4D 4Fil 4I 4Man 4Pay 4Saw 4Tet
 5Tri
 6Min 6Och 6Sis 6Wal 6Whi

Panicularia pauciflora

1Dee
 2Rou
 4Pay
 6F 6Och 6Ore 6R 6Wal

Panicum barbipulvinatum
 3Apa 3Coc 3Tus?

Panicum bulbosum
 3Chi 3Coc 3G 3Tus

Panicum bulbosum sciaphilum
 3Coc

Panicum clandestinum
 D7

Panicum depauperatum
 2Mic

Panicum hirticaule
 3Apa 3Cor 3M

Panicum obtusum
 2K
 3Apa 3Coc 3Cor 3G 3Pre 3Tus

Panicum pacificum
 4Pay

Panicum scribnerianum
 2N 2Sun
 6Colv

Panicum tsugetorum
 2Mic

Panicum virgatum
 2N
 3Coc 3Tus

Paspalum distichum
 D5

Paspalum stramineum
 2K 2N

Phalaris arundinacea
 4Lem 4Saw

Phalaris californica
 D5

Phalaris canariensis

1A
6Mal

Phalaris minor

5SB

Phleum alpinum

1A 1Bear 1H 1Lew 1Mad
2Bat 2Big 2Bon 2Bri 2Coc 2Col 2D 2G
2HC 2L 2Med 2RG 2SanI 2SanJ 2Sho
2Sop 2Sun 2U 2WR
3Apa
4Cac 4Car 4D 4Fis 4Lem 4Man 4Pal
4Pay 4Saw 4Tar 4Tet
5E 5I 5Ker 5Seq 5Tri
6Cra 6D 6F 6Min 6Och 6R 6Sis 6Uma
6Ump 6Wal 6Whi

Phleum pratense

1H
2Big 2Bon 2Col 2Har 2HC 2N 2SanI
2Sun 2WR
3Ala 3G
4Cac 4Car 4Man 4R 4Sev 4Tar 4Tet
5E 5Sha
6Mal 6Och 6Wal 6Whi

Phragmites phragmites

3Apa
4Man

Pleuraphis jamesii

3Coc 3J 3Tus?

Pleuraphis mutica

3G 3M

Pleuropogon refractus

6Sis 6Ump

Poa alcea

6Whi

Poa alpicola

2Med

Poa alpina

1Bear 1Lew 1Mad
2A 2Big 2Bon 2Coc 2Col 2D 2Hay 2Med
2SanJ 2U

Poa ampla

1Mad
2Big 2Bon
4Saw
6Wal

Poa annua

2SanJ
4Cac 4Man
5Seq 5Sha
6Cra

Poa arctica

2RG

Poa arida

1Sio
2Bat 2K
3Coc

Poa bigelovii

3D

Poa brachyglossa

5I 5Mno
6Wal

Poa brevipaniculata

2Was

Poa buckleyana

1Bear 1Beav 1Cus 1Dee 1Mad
2Big 2BH 2Bon 2Hay 2Med 2Sho 2Sun
2Was 2WR
4Car 4D 4Pal 4Pay 4Saw 4Sev 4U
5Sie
6Colv 6Och 6Uma 6Whi

Poa compressa

2Mic 2Sun 2Was
3Coc
4Man 4Tar
5Mod 5Tah
6Cas 6Whi

Poa epilis

1Bear 1Lew
2Med 2Was
4Saw
6Min

Poa fendleriana

2Coc 2Col 2G 2Mon 2Was
3Apa 3Coc 3G 3Tus
4Car 4D 4Fil 4Man

Poa gracillima

1Cle
5Mod 5Seq 5Sie
6F 6Min 6Wal

Poa hanseni

5Mod 5Mno

Poa idahoensis

6Wal 6Whi

Poa interior

1Dak 1H
2Big 2Bon 2Col 2Sop

Poa juncifolia

1Lew
2Mon 2Sho
4Man

Poa laevigata

1Bear 1Lew
2Big 2Med
4Cac 4Tar

Poa leibergii

5Mno 5Seq

Poa leptocoma

4Pay
6R

Poa lettermani

2P

Poa longepedunculata

2Med

Poa longiligula

3Coc
4Man 4SR 4Tar

Poa longipila

2Big

Poa lucida

2Bri

Poa macrantha

6Siu

Poa nematophylla

2Col

Poa nemoralis

1Dee
2Bat 2Med

Poa nervosa

1Dee
2Med
4Pay
6Wal

Poa nevadensis

1H
2Bon 2Bri 2Hay 2Sho
4Car 4Fis 4Man 4SR 4Saw 4Tar
5Mod 5Tri

Poa occidentalis

2G 2Mon
3Pec
4Man
5Seq

Poa olneyae

4Lem 4Pay
5Ker 5Mod 5Sie
6Cra 6F 6Min 6Och 6Ump 6Wal 6Whi

Poa paddensis

1Mad
6Wal

Poa pattersoni

4Tet

Poa phoenicea

2P

Poa pratensis
 1A 1Dee 1G 1H 1Lew 1Mad 1Pri
 2Bat 2Big 2BH 2Bon 2D 2G 2HC 2Har
 2Mic 2Mon 2N 2P 2Rou 2Sop
 3Ala 3Apa 3Coc 3G 3Pec 3Tus
 4Cac 4Car 4D 4Man 4Pay 4Saw 4Sev
 4Tar 4Tet
 5E 5Mod 5Tah 5Tri
 6Mal 6Och 6Ore 6San 6Uma 6Wal 6Whi

Poa pseudopratensis
 2Med

Poa reflexa
 2D 2G 2Rou
 4Man

Poa rhizomata
 1Bear
 5Mod

Poa rupicola
 1Bear 1Lew
 2Bon 2Col 2Hay
 D3

Poa sandbergii
 1Cle 1Cus 1Dee 1Lew
 2Bon 2Bri 2Med
 4Car 4Fil 4Man 4Pay 4Sev 4Tar
 5Mod 5Mno
 6Min 6Och 6R 6Uma 6Wal 6Whi

Poa saxatilis
 4Saw

Poa scabrella
 1Cle 1H
 4Man 4SR 4Tar 4Wei
 5Cal 5Mod 5Seq 5Sha 5Sie 5Tri
 6Min 6Och 6Sis 6Wal 6Whi

Poa subaristata
 4Saw 4Tar 4Tet

Poa sylvestris
 D7

Poa triflora
 1Bear 1Dee 1H 1Mad
 2BH 2Har 2HC 2Mon 2Sop 2Sun
 4Man 4Sal 4Tar
 6Ore 6Wal 6Whi

Poa trivialis
 1Bear
 6Colv

Poa vaseyana
 2Col

Poa vaseyochloa
 6Wal

Poa wheeleri
 1Cle 1Dee
 2Big 2Bon 2Coc 2Col 2G 2HC 2L 2Med
 2Sop
 4Pay 4Saw 4Tar 4Tet
 6Och 6Wal 6Whi

Polypogon littoralis
 2Col
 5Tri

Polypogon monspeliensis
 2K
 3Tus
 5A 5Mno
 6Cra 6F

Puccinellia nuttalliana
 1Beav 1Sio
 4Man

R

Redfieldia flexuosa
 2K 2N

S

Savastana odorata
 2HC
 4Tet
 6Ore

Schedonnardus paniculatus
 2N
 3Coc 3M 3Tus?

Sitanion breviaristatum
 6Whi

Sitanion brevifolium
 1Dee
 2BH 2Bon 2Col 2D 2Med 2SanJ
 3Coc 3D
 4Sev
 6Ore

Sitanion californicum
 2Big 2Bri 2Coc 2Har 2Mon 2RG 2U
 2WR
 3Coc 3G 3J 3Pec
 4Fis 4Min 4Nev 4Pay 4Saw
 5E 5I 5Ker 5Seq 5Sha 5Sie 5Tri
 6Colu 6Cra 6F 6San 6Ump 6Wal 6Whi

Sitanion ciliatum
 4Pay

Sitanion glabrum
 3Tus
 4LS 4Man
 5Ker 5Mod 5Sha 5Tri
 6F 6Uma

Sitanion hanseni
 4Lem
 5I 5Tri

Sitanion hystrix
 1H
 4Man 4Tar
 6Och 6Whi

Sitanion jubatum
 3Ala 3Z
 4Wei
 5Kla 5SB 5Seq

Sitanion longifolium
 1Bear
 2A 2RG
 3Chi 3Tus
 6Wenah

Sitanion minus
 2Hay
 5Mno 5Seq
 6Wal

Sitanion molle
 3Pre 3Tus

Sitanion montanum
 2Bon
 3Coc
 4R

Sitanion multisetum
 4Man
 6Wal

Sitanion pubiflorum
 2D 2SanI
 3Car 3Coc 3M
 4D

Sitanion rigidum
 6Whi

Sitanion rubescens
 6R

Sitanion velutinum
 6Wal

Sitanion villosum
 5I

Sorghastrum nutans
 2Mic 2N
 3Coc 3Tus?

Sphenopholis obtusata
 1Lew
 3D

Sporobolus airoides
 3Car 3Coc

Sporobolus asperifolius
 2K 2SanJ
 4Sev
 5I 5Mno
Sporobolus buckleyi
 3G
Sporobolus confusus
 3Ala 3Apa 3Coc 3Tus 3Z
Sporobolus cryptandrus
 2K 2N
 3Ala 3Apa 3Cor 3G 3M 3Tus
 4Man
 6Wal
Sporobolus giganteus
 3Chi
Sporobolus heterolepis
 2BH
Sporobolus interruptus
 3Coc 3Tus
Sporobolus ligulatus
 3G
Sporobolus ramulosus
 3Apa 3Coc
Sporobolus strictus
 3M
Sporobolus wrightii
 3Ala 3Cor 3S
Stipa comata
 1Cus 1H 1Lew
 2Big 2Col 2G 2N 2RG 2WR
 3Coc
 4D 4LS 4Man 4Sev 4Tar
 5I
 6Colv
Stipa coronata
 5SB 5Seq
Stipa elmeri
 5E 5Sha
 6Cra
Stipa eminens andersonii
 5Seq
Stipa lemmoni
 5Tri
 6F
Stipa lemmoni jonesii
 5Sha
Stipa lettermani
 2Hay 2Med
 4Man 4Saw 4U
 5E 5Tri
 6Whi
Stipa minor
 1Lew
 2Big 2Bri 2Med 2Mon 2Rou
 4Cac 4Fil 4Man 4Saw 4Sev
 5I 5Ker 5Mod 5Mno 5Sha 5Tah
 6Och 6Ump 6Wal 6Wenah
Stipa nelsoni
 2Mon 2P
 4Saw 4U
Stipa neomexicana
 3Coc
Stipa occidentalis
 4Pay
 5E 5I 5Ker 5Seq 5Sha 5Sie
 6F 6Och 6Ore 6Uma 6Wal 6Whi
Stipa pringlei
 3Tus
Stipa richardsonii
 1H 1Lew 1Mis
 2Med

Stipa setigera
 5Sie
Stipa speciosa
 4Nev
 5Ker
Stipa thurberiana
 5Mod
Stipa tweedyi
 2Mon 2WR
 3Tus
 4Car 4Tar
Stipa vaseyi
 3Apa 3Pec
Stipa viridula
 1Bear 1Bla 1Dee 1H 1Sio
 2BH 2Col 2Hay 2HC 2L 2Med 2N
 2SanI 2SanJ
 4Car 4Fis 4Pay 4Tar
 6Colu
Stipa williamsii
 2Big
 4Fis 4Pay
Syntherisma sanguinalis
 3Apa
 6Cra

T

Tridens avenaceus
 3Cor
Tridens pulchellus
 3Apa 3Chi 3Cor
Tridens strictus
 3Cor
Triplasis purpurea
 2K
Trisetum brandegei
 1H
 4Pal
 5Ker
 6Och 6Uma 6Wal
Trisetum canescens
 1Pri
 4Man
 5Sha 5Tri
 6D
Trisetum cernuum
 6Wal
Trisetum melicoides
 6Wal
Trisetum montanum
 2Mon
 4Saw
Trisetum spicatum
 1Bear 1Cle 1H 1Lew 1Sel
 2Bon 2Bri 2Coc 2Col 2G 2HC 2Med
 2Mon 2P 2RG 2SanJ 2Sho 2Sop 2U
 3Coc
 4Car 4D 4Lem 4Man 4Pay 4Saw 4Tar
 5I 5Ker 5Seq 5Sie
 6Min 6Och 6Ore 6R 6San 6Wal 6Whi
Trisetum wolffi
 1Dee
 4Pal 4Pay
Triticum vulgare
 6Cra 6Mal

V

Valota saccharata
 3Apa 3Cor

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<i>Bromus carinatus</i>	51	<i>filiformis</i>	122	<i>interruptus</i>	172
<i>carinatus californicus</i>	52	<i>gracilis</i>	122	<i>ligulatus</i>	173
<i>polyanthus</i>	56	<i>gracillima</i>	123	<i>ramulosus</i>	173
<i>porteri</i>	57	<i>monticola</i>	124	<i>strictus</i>	174
<i>frondosus</i>	57	<i>neomexicana</i>	124	<i>wrightii</i>	174
<i>richardsoni</i>	58	<i>pauciflora</i>	124	<i>Stipa comata</i>	175
<i>pallidus</i>	58	<i>porteri</i>	124	<i>neomexicana</i>	179
<i>subvelutinus</i>	59	<i>racemosa</i>	125	<i>pringlei</i>	180
<i>Capriola dactylon</i>	69	<i>repens</i>	125	<i>tweedyi</i>	182
<i>Chaetochloa composita</i>	70	<i>squarrosa</i>	126	<i>vaseyi</i>	182
<i>glaucia</i>	71	<i>vaseyana</i>	126	<i>Syntherisma sanguinalis</i>	184
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<i>italica</i>	71	<i>wrightii</i>	126	<i>pulchellus</i>	185
<i>verticillata</i>	72	<i>Munroa squarrosa</i>	127	<i>strictus</i>	186
<i>viridis</i>	72	<i>Nazia aliena</i>	127	<i>Trisetum spicatum</i>	189
<i>Chloris elegans</i>	73	<i>Oryzopsis fimbriata</i>	129	<i>Valota saccharata</i>	192
<i>Deschampsia caespitosa</i>	78				

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<i>dasystachyum</i>	11	<i>Danthonia americana</i>	74	<i>epilis</i>	148
<i>flexuosum</i>	11	<i>californica</i>	75	<i>fendleriana</i>	148
<i>gmelini</i>	12	<i>intermedia</i>	75	<i>juncifolia</i>	149
<i>lanceolatum</i>	12	<i>Deschampsia caespitosa</i>	78	<i>laevigata</i>	149
<i>pseudorepens</i>	13	<i>danthonioides</i>	79	<i>leptocoma</i>	150
<i>scribneri</i>	15	<i>elongata</i>	79	<i>longiligula</i>	151
<i>smithii</i>	15	<i>gracilis</i>	79	<i>nervosa</i>	152
<i>spicatum</i>	16	<i>Elymus condensatus</i>	85	<i>nevadensis</i>	153
<i>tenuispicum</i>	18	<i>glaucus</i>	85	<i>occidentalis</i>	153
<i>subvillosum</i>	18	<i>triticoides</i>	88	<i>olneyae</i>	153
<i>tenerum</i>	19	<i>Festuca brachyphylla</i>	94	<i>pattersoni</i>	154
<i>vaseyi</i>	20	<i>calligera</i>	95	<i>pratensis</i>	154
<i>violaceum</i>	20	<i>confinis</i>	95	<i>reflexa</i>	155
<i>Agrostis alba</i>	22	<i>idahoensis</i>	96	<i>sandbergii</i>	156
<i>alba vulgaris</i>	22	<i>occidentalis</i>	98	<i>saxatilis</i>	156
<i>exarata</i>	23	<i>octoflora hirtella</i>	99	<i>scabrella</i>	157
<i>hiemalis</i>	25	<i>ovina</i>	99	<i>subaristata</i>	157
<i>idahoensis</i>	26	<i>pseudovina</i>	100	<i>triflora</i>	158
<i>rossae</i>	27	<i>rubra</i>	101	<i>wheeleri</i>	159
<i>Alopecurus aristulatus</i>	30	<i>subulata</i>	101	<i>Puccinellia nuttalliana</i>	160
<i>occidentalis</i>	31	<i>viridula</i>	102	<i>Savastana odorata</i>	161
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<i>hirsuta</i>	48	<i>bulbosa</i>	115	<i>hanseni</i>	164
<i>Bromus brizaeformis</i>	51	<i>spectabilis</i>	118	<i>hystrix</i>	165
<i>carinatus</i>	51	<i>stricta</i>	119	<i>jubatum</i>	165
<i>hordeaceus</i>	53	<i>subulata</i>	119	<i>montanum</i>	167
<i>inermis</i>	54	<i>Muhlenbergia comata</i>	121	<i>multisetum</i>	167
<i>marginatus</i>	55	<i>filiformis</i>	122	<i>pubiflorum</i>	167
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<i>Achyrodes aureum</i>	9	<i>Danthonia americana</i>	74	<i>Muhlenbergia comata</i>	121
<i>Agropyron caninum</i>	10	<i>californica</i>	75	<i>filiformis</i>	122
<i>flexuosum</i>	11	<i>intermedia</i>	75	<i>jonesii</i>	123
<i>pringlei</i>	13	<i>unispicata</i>	77	<i>microsperma</i>	123
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<i>vaseyi</i>	20	<i>danthonioides</i>	79	<i>Oryzopsis hymenoides</i>	129
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<i>ampla</i>	23	<i>gracilis</i>	79	<i>Panicularia elata</i>	131
<i>exarata</i>	23	<i>holciformis</i>	79	<i>erecta</i>	132
<i>foliosa</i>	24	<i>Distichlis spicata</i>	80	<i>nervata</i>	132
<i>hallii</i>	24	<i>Echinochloa crus-galli</i>	81	<i>Paspalum distichum</i>	139
<i>hiemalis</i>	25	<i>Elymus canadensis</i>	84	<i>Phalaris californica</i>	140
<i>geminata</i>	25	<i>condensatus</i>	85	<i>minor</i>	141
<i>microphylla</i>	26	<i>glaucus</i>	85	<i>Phleum alpinum</i>	141
<i>rossae</i>	27	<i>triticoideis</i>	88	<i>pratense</i>	142
<i>schiedeana</i>	27	<i>Epicampes rigens</i>	89	<i>Poa annua</i>	145
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<i>thurberiana</i>	28	<i>mexicana</i>	91	<i>buckleyana</i>	147
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<i>Alopecurus aristulatus</i>	30	<i>Festuca altaica</i>	93	<i>gracillima</i>	148
<i>californicus</i>	30	<i>brachyphylla</i>	94	<i>hanseni</i>	149
<i>geniculatus</i>	31	<i>bromoides</i>	95	<i>leibergii</i>	150
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<i>Bromus arenarius</i>	50	<i>idahoensis</i>	96	<i>sandbergii</i>	156
<i>brizaeformis</i>	51	<i>megalura</i>	97	<i>scabrella</i>	157
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<i>californicus</i>	52	<i>occidentalis</i>	98	<i>monspeliensis</i>	159
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<i>hordeaceus</i>	53	<i>rubra</i>	101	<i>jubatum</i>	165
<i>leptostachys</i>	54	<i>subulata</i>	101	<i>minus</i>	166
<i>marginatus</i>	55	<i>supina</i>	102	<i>villosum</i>	169
<i>seminudus</i>	55	<i>viridula</i>	102	<i>Sporobolus asperifolius</i> ..	171
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<i>subvelutinus</i>	59	<i>gussoneanum</i>	106	<i>elmeri</i>	176
<i>tectorum nudus</i>	60	<i>jubatum</i>	106	<i>eminens andersonii</i>	176
<i>trinii</i>	60	<i>murinum</i>	106	<i>lemmoni</i>	177
<i>unioloides</i>	61	<i>nodosum</i>	107	<i>jonesii</i>	177
<i>villosus</i>	61	<i>Koeleria cristata</i>	108	<i>lettermani</i>	177
<i>gussonei</i>	62	<i>Lolium multiflorum</i>	112	<i>minor</i>	178
<i>vulgaris</i>	62	<i>temulentum</i>	113	<i>occidentalis</i>	179
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<i>californica</i>	64	<i>bella</i>	115	<i>speciosa</i>	181
<i>canadensis</i>	64	<i>bulbosa</i>	115	<i>thurberiana</i>	182
<i>densa</i>	65	<i>frutescens</i>	116	<i>Trisetum brandegei</i>	187
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<i>purpurascens</i>	67	<i>imperfecta</i>	117	<i>spicatum</i>	189
<i>Dactylis glomerata</i>	74	<i>stricta</i>	119		

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<i>flexuosum</i>	11	<i>danthonioides</i>	79	<i>Phalaris canariensis</i>	140
<i>gmelini</i>	12	<i>elongata</i>	79	<i>Phleum alpinum</i>	141
<i>lanceolatum</i>	12	<i>gracilis</i>	79	<i>pratense</i>	142
<i>pseudorepens</i>	13	<i>holciformis</i>	79	<i>Pleuropogon refractus</i>	144
<i>repens</i>	14	<i>Distichlis spicata</i>	80	<i>Poa alcea</i>	144
<i>riparium</i>	14	<i>Echinochloa zelayensis</i>	82	<i>ampla</i>	145
<i>spicatum</i>	16	<i>Elymus aristatus</i>	83	<i>annua</i>	145
<i>inermis</i>	18	<i>borealis</i>	84	<i>brachyglossa</i>	147
<i>tenerum</i>	19	<i>condensatus</i>	85	<i>buckleyana</i>	147
<i>violaceum</i>	20	<i>glaucus</i>	85	<i>compressa</i>	147
<i>Agrostis aequivalvis</i>	21	<i>leckenbyi</i>	87	<i>epilis</i>	148
<i>alba</i>	22	<i>Eragrostis megastachya</i>	90	<i>gracillima</i>	148
<i>exarata</i>	23	<i>Festuca bromoides</i>	95	<i>idahoensis</i>	149
<i>foliosa</i>	24	<i>californica</i>	95	<i>leptocoma</i>	150
<i>hiemalis</i>	25	<i>calligera</i>	95	<i>macrantha</i>	152
<i>geminata</i>	25	<i>elatior</i>	96	<i>nervosa</i>	152
<i>pallens</i>	27	<i>idahoensis</i>	96	<i>olneyae</i>	153
<i>rossae</i>	27	<i>megalura</i>	97	<i>paddensis</i>	154
<i>schiedeana</i>	27	<i>microstachys</i>	97	<i>pratensis</i>	154
<i>thurberiana</i>	28	<i>occidentalis</i>	98	<i>sandbergii</i>	156
<i>Alopecurus aristulatus</i>	30	<i>octoflora</i>	98	<i>scabrella</i>	157
<i>Ammophila arenaria</i>	32	<i>ovina</i>	99	<i>triflora</i>	158
<i>Aristida longiseta</i>	40	<i>pacifica</i>	100	<i>trivialis</i>	158
<i>Avena fatua glabrata</i>	43	<i>pseudovina</i>	100	<i>vaseyochloa</i>	158
<i>Beckmannia erucaeformis</i>	44	<i>reflexa</i>	100	<i>wheeleri</i>	159
<i>Bromus brizaeformis</i>	51	<i>rubra</i>	101	<i>Polypogon monspeliensis</i>	159
<i>carinatus</i>	51	<i>megastachys</i>	101	<i>Savastana odorata</i>	161
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<i>seminudus</i>	55	<i>gussoneanum</i>	106	<i>longifolium</i>	165
<i>richardsoni</i>	58	<i>jubatum</i>	106	<i>minus</i>	166
<i>secalinus</i>	59	<i>nodosum</i>	107	<i>multisetum</i>	167
<i>subvelutinus</i>	59	<i>Koeleria cristata</i>	108	<i>rigidum</i>	167
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<i>canadensis</i>	64	<i>fugax</i>	116	<i>lemmoni</i>	177
<i>rubescens</i>	67	<i>geyeri</i>	116	<i>lettermani</i>	177
<i>scribneri</i>	68	<i>harfordii</i>	117	<i>minor</i>	178
<i>Chaetochloa glauca</i>	71	<i>imperfecta</i>	117	<i>occidentalis</i>	179
<i>Cinna latifolia</i>	73	<i>spectabilis</i>	118	<i>viridula</i>	183
<i>Dactylis glomerata</i>	74	<i>subulata</i>	119	<i>Syntherisma sanguinalis</i>	184
<i>Danthonia americana</i>	74	<i>Muhlenbergia comata</i>	121	<i>Trisetum brandegei</i>	187
<i>californica</i>	75	<i>filiformis</i>	122	<i>canescens</i>	188
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<i>spectabilis</i>	118	<i>clandestinum</i>	135	<i>paddensis</i>	154
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<i>subulata</i>	119	<i>hirticaule</i>	135	<i>platyphylla</i>	153
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<i>pinetorum</i>	76	<i>sanguinale</i>	184	<i>reflexa</i>	155
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<i>cuspidata</i>	121	<i>Phalaris amethystina</i>	140	<i>subaristata</i>	157
<i>debilis</i>	123	<i>arundinacea</i>	140	<i>subpurpurea</i>	154
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[illegible]

Form 172.

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